APRIL 1952 IN TWO PARTS - PART ONE

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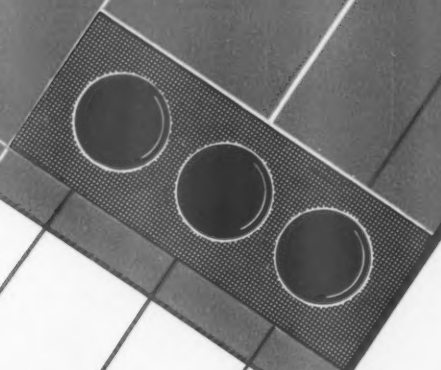
FACTORY

MANAGEMENT AND MAINTENANCE

PRESENTS *The*

FACTORY OF THE FUTURE



EQUIPMENT

PROCESSES

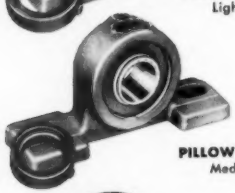
MANAGEMENT

It's easier than you think...

to equip with ball bearings

FAFNIR economy packages

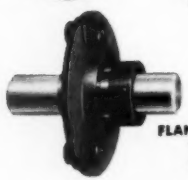
Typical Fafnir "packaged" ball-bearing units



PILLOW BLOCKS
Light Series

PILLOW BLOCKS
Medium and Heavy Series

RUBBER UNITS
including Flange and Cylindrical Types

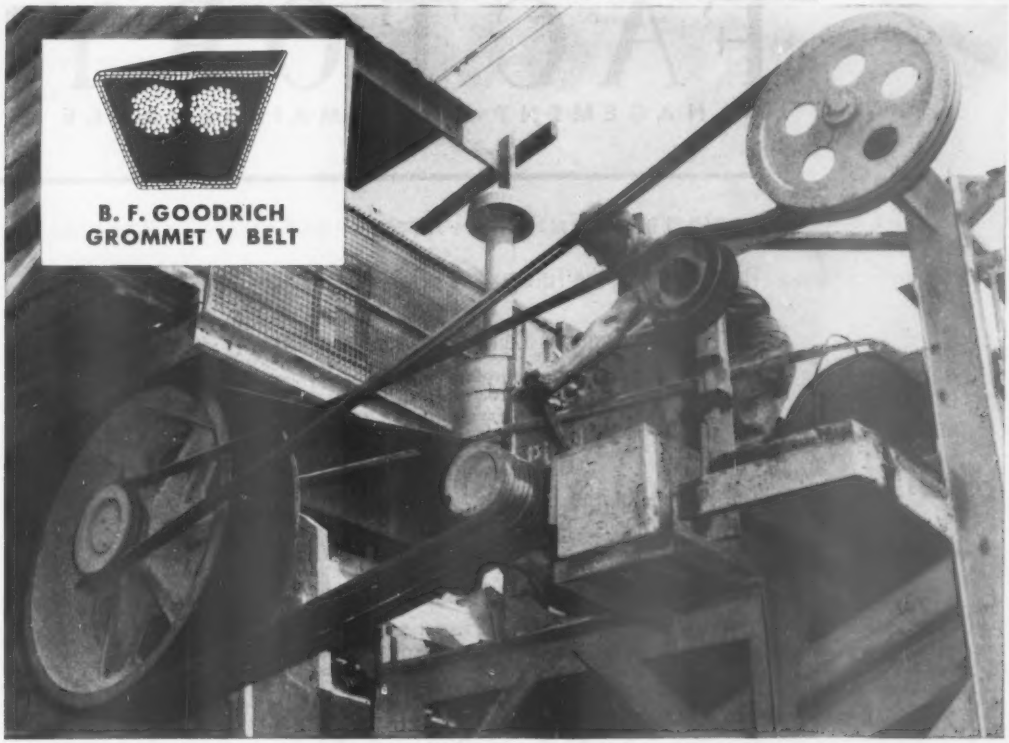


FLANGETTE
with pressed Steel Flanges and Mechani-Seals

Would you like to add the advantages of ball bearings to your power transmission equipment? Maybe you've passed them up feeling that a changeover would involve extra work, too much down time, extra parts . . . machining, special housings, lubricating systems. ✓ ✓ ✓ With Fafnir Economy Packages, it's easier than you think to equip with ball bearings. These units are complete with housings, seals and shields . . . ready to slip into place on an amazing variety of machines and equipment. Fafnir Economy Packages feature the famous Fafnir Wide Inner Ring Bearing with Self-Locking Collar . . . easiest of all to install . . . no shouldering, threading, lock nuts or adapter devices. ✓ ✓ ✓ Whatever industry you're in, a few minutes spent with an Authorized Fafnir Distributor may bring forth an Economy Package that assures ball bearing smoothness, power-saving and maintenance-saving for your power transmission equipment. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Three years at hard labor for B. F. Goodrich grommet belts

B. F. Goodrich grommet V belts cut costs 20 to 50%

POUNDING action of this machine put terrific shock and strain on the V belts. Belts are outdoors, have to stand rain, dust and dampness. When belts wore out, work stopped—costs went up by the minute.

Then a B. F. Goodrich man suggested using B. F. Goodrich grommet V belts. When the picture above was taken, the grommet belts had been in use 3 years, and looked good for a lot more service. BFG grommet belts look the same as ordinary belts but, because they are made in an entirely different way, grommet belts stand more shocks and heavier loads than any other kind. Here's why:

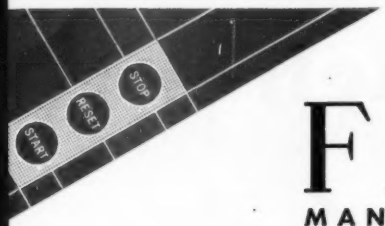
No cord ends—A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength—All of the cord material in a B. F. Goodrich grommet multiple-V belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

Better grip, less slip— Because a grommet is endless, a grommet V belt is more flexible, grips the pulleys better. Size for size, grommet multiple-V belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

Only B. F. Goodrich has the grommet!— No other multiple-V belt is a grommet V belt (U. S. Patent No. 2,233,294). Now available in C, D and E sections. See your local B. F. Goodrich distributor. *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio.*

Grommet V Belts BY
B.F.Goodrich
RUBBER FOR INDUSTRY



FACTORY

MANAGEMENT AND MAINTENANCE

APRIL 1952 • IN TWO PARTS • PART ONE • A SPECIAL

The Factory of the Future — an editorial 67

Why Today's Factories Can't Meet 1960's Needs 68

Our population is growing relatively faster than our workforce. Defense needs may drop from present levels, but will remain high for a long time. So, to continue increasing our standard of living as fast as we have in the last decade, we need a big increase in output per worker.

The Factory of the Future Is Here Today — Piecemeal 73

This Automatic Plant Could Be Built Today 74

Who says fully automatic plants are just dreamy-eyed visions? Here's a blueprint for a "no-operator" piston factory. It was designed by a group at the Harvard Business School. You could build it with the machines and control devices available today — and your output wouldn't be limited to pistons.

This 99% Automatic Plant Is Running Today 78

Ferro-Enamel Company needs only three production operators and one supervisor per shift to run its napalm plant. A look-see at this almost completely automatic Cleveland factory should convince almost anyone that the "impossible" is a reality.

Glossary: You'll Be Talking This Lingo in the Factory of the Future 80

Advanced technology is bringing with it a raft of new, semi-technical terms. To make the most of technological possibilities, you'll need to know about such things as servo-systems, digital computers, bio-mechanics, transistors, and modularization.

The Technology Is Ready for the Factory of the Future 85

In isolated cases, companies are already using the advanced machines, equipment, and production techniques that will make up the factory of the future. Here's where you can find out what they are, and get suggestions on how you can adapt them for use in your own industry.

THIS ENTIRE ISSUE is devoted to telling you about the factory of the future.

We haven't put any time limit on "the future." It could be tomorrow (literally) if you want to make it so. It may be years away (especially if you want to make it so).

To many people the factory of the future is a fully automatic plant. To others it is a "pushbutton" plant — with no manual labor, but with human beings to "push the buttons" controlling processes. Even in the ultimate, fully automatic factory, someone will have to start and stop production at the beginning and end of the plant's "life."

That's why — to symbolize the factory of the future — whether "pushbutton" or fully automatic — we have adopted the artist's conception of a "pushbutton control" shown at the upper left.

FACTORY MANAGEMENT AND MAINTENANCE
April, 1952 . . . . . Vol. 110, No. 4
(a consolidation of Factory and Industrial Management, including Factory, and Maintenance Engineering) Published monthly by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948), Founder. **Publication Office: 330 W. 42nd St., New York 36, N. Y.**
Executive, Editorial, and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y.

Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

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FOR 61 YEARS

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REPORT ON THE FACTORY OF THE FUTURE

Management Problems in the Factory of the Future . . 100

New management techniques are making possible the introduction of advanced technology. It, in turn, is forcing other management changes. Here's what the problems are, and how to handle them.

Today's New Product Materials Are Ready for the Factory of the Future 110

A lot of new product materials are ready for industry. Many new applications have been found for "old" materials. This article by the staff of **Product Engineering** tells how changes in materials will affect product design and simplify production.

The Atom Is Now Helping Shape the Factory of the Future..... 116

In a special article for FACTORY, T. Keith Glennan of the Atomic Energy Commission describes how industry is using atoms today — and how you can, too. He also tells what the atom has in store for you in the next few years.

Atomic Glossary for the Factory of the Future..... 120

You won't have to become a nuclear physicist just because atoms move into your plant. But you will have to know such things as what beta rays are used for, and the safe roentgen dosage of radioactivity.

Departments

Looking Ahead in Labor.....after 64
Looking Ahead in Business.....before 65
What's New in Equipment.....122
Practical Labor Relations.....182
You Mustn't Miss.....198
Books and Booklets.....228
Industrial Films.....240
Plant Engineering Problems.....246
Plant Operating Problems.....250

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Single copies, 50¢; in Latin America, 75¢; in all other countries, $1.50. Subscription rates — United States, U. S. possessions: $3, 1 year; $4, 2 years; $5, 3 years. Canada: $5, 1 year; $8, 2 years; $10, 3 years. Pan-American countries: $15, 1 year; $25, 2 years; $30, 3 years. Other countries: $20, 1 year; $30, 2 years; $40, 3 years.

Entered as second-class matter July 22, 1948, at the post office at New York, New York, under the Act of March 3, 1879. Printed in U.S.A. Copyright 1952 by McGraw-Hill Publishing Company, Inc. All rights reserved.

How to "wrap-up" a 1200-lb. package!

Heavy, hard-to-handle rolls of plastic sheeting speed their way safely and economically to automotive safety glass manufacturers in strong, shock-absorbing, freight-saving H & D corrugated Pallet Paks. Previously, drums were used with a resulting high handling and shipping expense. Now—this simplified packaging method, developed by the H & D Package Laboratory, protects nine rolls in shipment. Over-all packing, handling, and storage costs are materially reduced. Use H & D material handling methods to *your advantage*. You will realize freight savings, easier packing, simpler handling, better product protection, more economy at every step. For 13-volume "Little Packaging Library," write Hinde & Dauch, 5202 Decatur Street, Sandusky, Ohio.

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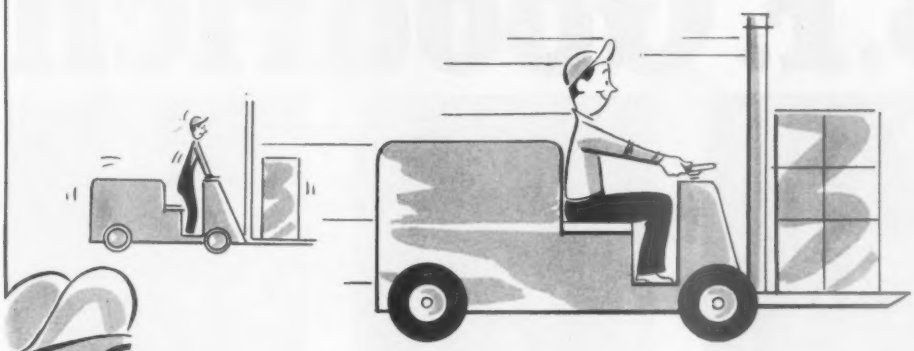
Authority on Packaging



This "Joe" sits down every day

(AND GETS AWAY WITH IT)

Ever subject yourself to thousands of daily jolts and jars? Then you know why Joe's former "stand up" habit was a natural one. But the company got wise to the excessive cost of jolting lift trucks and started a replacement program—equipping new, and old lift trucks with MONARCH MONO-CUSHION TIRES. Now, Joe gets a soft ride and the company saves money on floor and truck maintenance.

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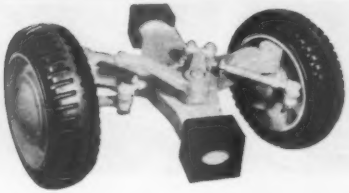
8. High efficiency under heavy loads.
9. Lowest operating cost of any drive.
10. Can be removed from truck in less than 1 hour.
11. Full floating axle shafts easily removed.

THE SIMPLEST TRAILING AXLE FOR INDUSTRIAL TRUCKS



1. Baker patented wide angle steer provides maximum maneuverability.
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4. Effective snubbing of road shocks.
5. Constant smooth traction on drive wheels.
6. Proper steering geometry minimizes scrubbing of tires.
7. Steering connections above axle for protection from damage and maximum underclearance.
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9. Tapered wheel bearings reduce friction.
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11. Trailing axle can be removed from truck in 20 minutes.

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1. All-welded steel plate construction.
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6. Designed for easy access to truck components requiring maintenance.
7. Designed for quick, easy removal of mast, power axle and trailing axle.

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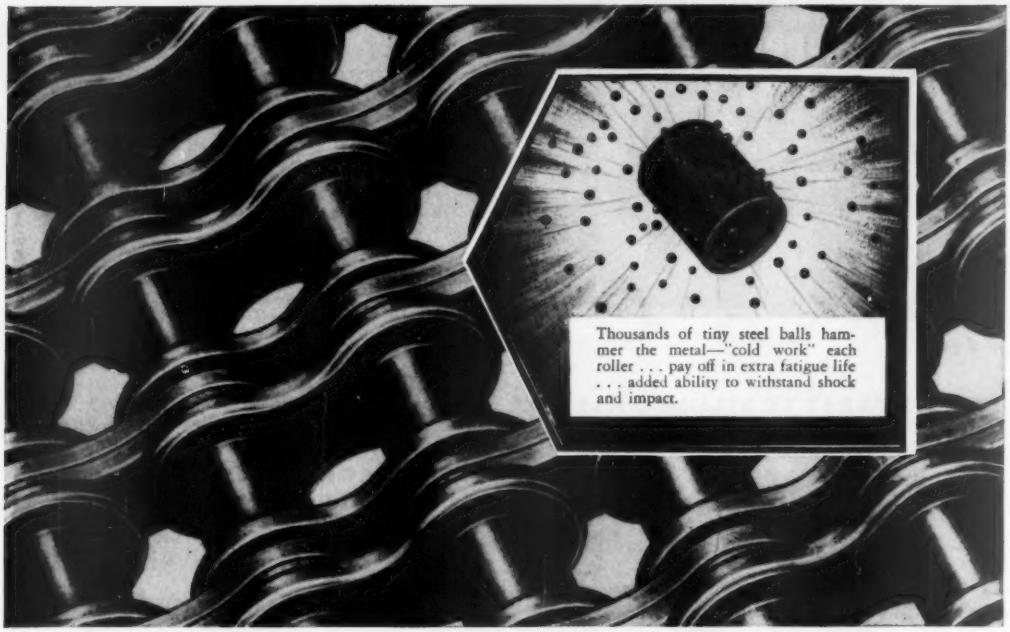
Thousands of tiny steel balls hammer the metal—"cold work" each roller . . . pay off in extra fatigue life . . . added ability to withstand shock and impact.

look for the darkened rollers!

THERE are sound reasons for the universal acceptance of Link-Belt Precision Steel Roller Chain. Two of them—shot-peened rollers and Lock-type Bushings—are shown here.

Others include Link-Belt's rigid material selection and controlled heat treating—your assurance of absolute uniformity with no weak members.

Whether it's for drive or conveyor service, you can get the best in roller chain from the complete Link-Belt line—single and multiple widths, in ⅜" through 3", and double pitch, 1" through 3". Next time you need roller chain, call the Link-Belt office near you.

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PRECISION STEEL ROLLER CHAIN

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal Cities. 12,017

Lock-type Bushings increase ability to withstand shock loads

A special manufacturing process securely locks the inside sidebars on the bushing, preventing lateral movement of the sidebars and eliminating a common cause of stiff chains. This Link-Belt development is applied on roller chains through 1" pitch and double pitch roller chains through 2" pitch.

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A-C ENGINEERS CAN HELP YOU WITH THESE PROBLEMS

☛ The proper pipe size for the most economical installation.

☛ The type and size pump that best fits the conditions of the job.

☛ Design modifications in the pump that may prove necessary.

ALL THIS is done for you by experienced men who do nothing but pump engineering. Moreover, if you call an A-C representative early in your planning, he may even be able to offer suggestions in the placement of pumps or piping that can mean improved performance or savings in manufacturing cost.

Allis-Chalmers engineers can show you the one best solution to your pump problem. They know the short-cuts, the things to avoid.

You can have more time to devote to design problems!

And Allis-Chalmers has the pumps too! There's a type and size pump for practically every job from fractional units up to the biggest. If needed, Allis-Chalmers will make modifications to do a job.

So call your nearby Allis-Chalmers district office to solve your pump problems or write: Allis-Chalmers, Milwaukee 1, Wisconsin. A-3573

Electrifugal is an Allis-Chalmers trademark.

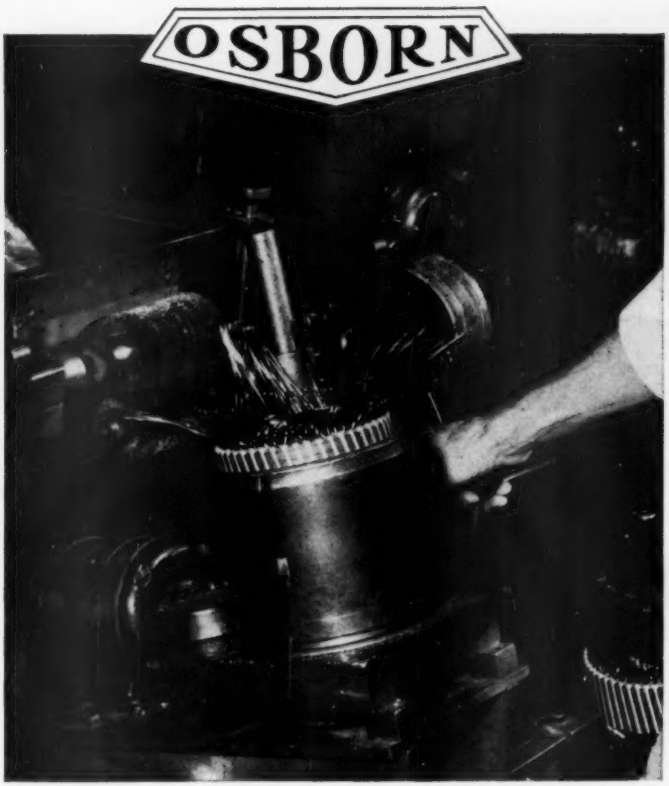
ALLIS-CHALMERS A-C **PUMPS**

ELECTRIFUGAL PUMP — a close-coupled pump combining maximum space for packing maintenance with exceptional rigidity. From motor end housing to pump casing, frame is one piece of cast iron. Sizes 10 to 1600 gpm; heads to 525 feet.

PACKAGE PUMP — with open or closed impeller. Widely used for air conditioning and refrigeration. Made in several fractional horsepower sizes using NEMA standard motors of well-known make. Capacities to 80 gpm; heads to 100 feet.

PEDESTAL MOUNTED PUMP—For use where flexible coupling or V-belt drive is desired. Essentially the same pump as package pump at left, except that bearing bracket is substituted for motor. A-C also furnishes motor, drive, control. See ratings at left.

VERTICAL MOUNTED PUMP — Open impeller unit with special cover plate and flange for vertical mounting. Used in air conditioning to save piping cost. Also used as coolant pump for machine tools. Capacities to 80 gpm; heads to 100 feet.



How to make parts come clean . . . at the push of a button

It takes only 8 seconds to remove the enamel insulation from the entire bunch of a motor's coil leads with the set-up shown above. This stripping, preparatory to soldering, is done with Osborn power brushing . . . automatically . . . at the push of a button.

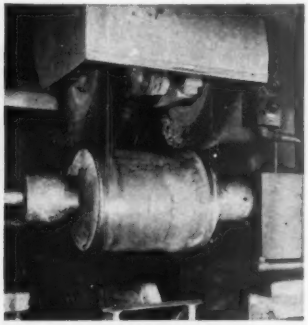
Wire stripping is typical of thousands of cleaning operations throughout Industry which have been simplified and speeded by Osborn Power Brushes. Your **O**sborn **B**rushing **A**nalyst is experienced in finding solutions to cleaning and finishing problems of all kinds.

His service is backed by the extensive engineering facilities of Osborn, to devise brushing methods and special machines *to help you.* There is no obligation. Call today or write *The Osborn Manufacturing Company, Dept. 678, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

OFF COMES RUST. These two counter-rotating Osborn Master® Wire Wheel Brushes, powered by 1½ h.p. motors, clean rust and scale from 2-inch pipe preparatory to fabrication. Cleans 15-feet of pipe per minute . . . at the push of a button.



OFF COMES SLAG. It takes only 40 seconds for these Osborn Wire Wheel Brushes to whisk away all slag and scale from both end welds of compressor heads . . . at the push of a button.

OFF COMES FLASH. Removal of rubber flash of rubber-to-steel joints of army tank track shoes is simply a matter of sliding the shoes across the face of an Osborn Disc-Center* Wire Wheel Brush. A mass production operation . . . at the push of a button.

*Trademark

Everyone Can Count on VEEDER-ROOT

Here's still another good soldier, on a highly special assignment. With contact assembly, it counts miles and yards, when used in conjunction with other equipment. And it also makes contacts on *predetermined* readings . . . *direct* readings that need no translation.

Now, as the counting process comes to be counted as more and more indispensable to all types of defense materiel, what might we do . . . *especially for you?* Just say when you'd like to get together...*and start figuring.*

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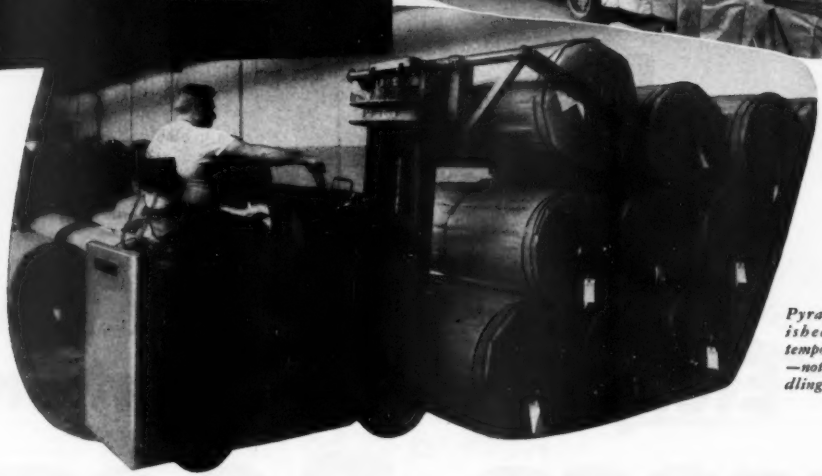
"Counts Everything on Earth"

ELWELL-PARKER TRUCKS EASE the SQUEEZE

on round-the-clock production

Unit Load Handling of bale pulp saves time, labor and space.



Pyramiding finished fabric in temporary storage —note special cradling attachment.

At a large midwestern rayon plant, *continuous* operation is essential in many processes. Elwell-Parker trucks contribute mightily by steady, reliable service.

From basement storage, an E-P fork truck delivers baled wood pulp to the steeping room via elevator. It loads 3 four-bale tiers on the elevator and, with a fourth tier on its forks, rides to the third floor, where the material is distributed to the steeping presses. In 8 hours, this truck delivers enough material to keep the steeping presses going 24 hours.

In another operation three fume-free electric E-P trucks are used in the aging room, which is windowless and under controlled temperature and humidity. Here, Elwell-Parkers replaced hand trucks. Loads are now 2½ times larger and are handled more safely. Elwell-Parker reliability really pays off in this continuous operation. Special automatic fingertip control for frequent start and stop and low pressure hydraulic system are employed on these trucks.

Another Elwell-Parker with cradle attachment carries rolls of finished fabric from the looms and pyramids them in temporary storage. One truck readily keeps abreast of the entire production.

Elwell-Parker trucks are preventing production bottlenecks in over 300 industries. For advice about your specific needs, request Elwell-Parker's *Industrial Logistics Service.* Write The Elwell-Parker Electric Company, 4023 St. Clair Ave., Cleveland 3, Ohio.

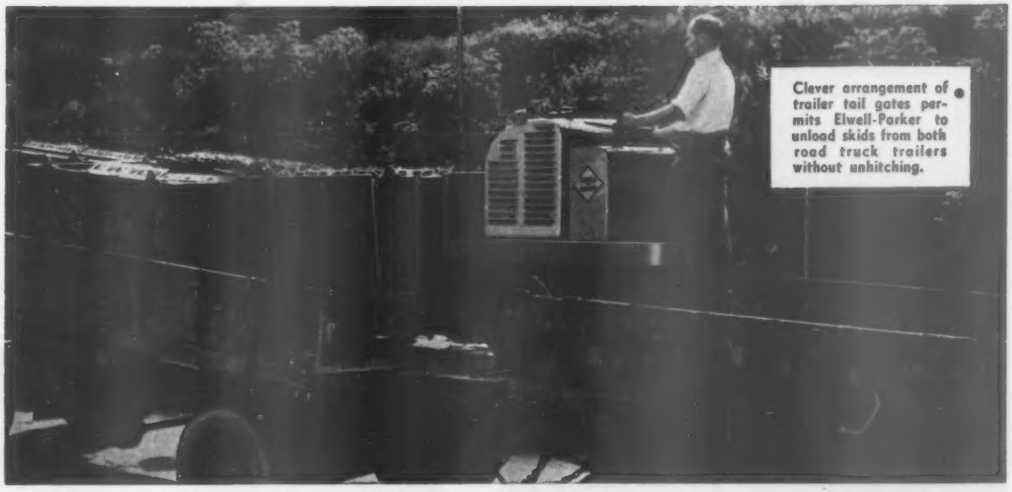
NEW General Catalog

describes all types of Elwell-Parkers in detail. Write for your copy NOW!

ELWELL-PARKER

POWER INDUSTRIAL TRUCKS

Established 1893



Clever arrangement of trailer tail gates permits Elwell-Parker to unload skids from both road truck trailers without unhitching.

One Truck Carries 640 Tons Daily

Mechanized handling of castings has cut transportation costs 50% and has eliminated manual labor. Incoming loads handled 8 times faster.

THE OLD WAY

Originally, castings for automotive engines were just dumped into railroad cars at the foundry. Upon arrival at the engine assembly plant, parts had to be sorted, counted and manually loaded into push carts for movement to storage. This required an army of men, counts were inaccurate and loose shipment made freight rates high.

THE NEW WAY

Now each class of castings is placed in special skid boxes at the foundry. Road truck then delivers skids to assembly plant. Here an Elwell-Parker low lift truck enters directly into road vehicle and transfers skids to receiving dock. Next a high lift Elwell-Parker either double stacks the skids in storage or takes them to production machines. Each E-P truck handles 40 tons per hour, 16 hours per day.

BIG BENEFITS

1. Transportation costs have been cut in half.
2. A road unit of 12 skids is unloaded in 15 minutes by the Elwell-Parker, compared with several hours by the previous manual methods.
3. Inventories are accurate at all times.

Elwell-Parker, drawing on its 45 years' experience, can help *you* develop a well-planned, integrated materials handling system by employing ***Industrial Logistics Service***. The investment will quickly be amortized and then repaid many times over. Without obligation write us about your problem. The Elwell-Parker Electric Co., 4248 St. Clair Ave., Cleveland 3, O.

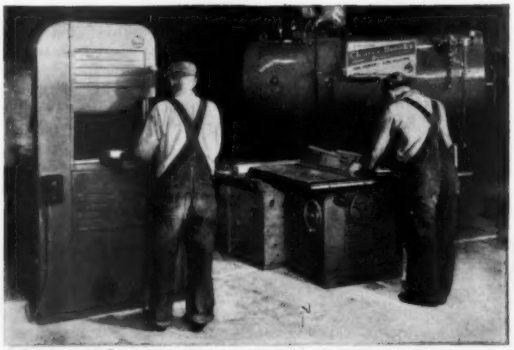
At dock high lift Elwell-Parker double stacks skids and transports them to production or storage.

Skid box has swing-up end door. When placed on a tilting rack, castings flow onto table within easy reach of machine operator. This method increased machine productivity 100% compared to hand unloading of box by operator.

HOW three companies whip crating and maintenance costs by using DELTA TOOLS

Delta 12" Tilting Arbor Saw Has Needed No Maintenance
. . . at **Crompton & Knowles Loomworks, Worcester, Massachusetts**

Each power loom built for export shipment presents an individual crating problem; and the "hub" of that major wood-cutting operation is a Delta 12-inch tilting arbor saw. It rips random-width lumber to proper sizes for the individual crates. The main body of each loom reaches the crating shop bolted to a wooden frame, exactly as it will be bolted to the floor later on. It is then braced to prevent shifting, and a box is built up around it. This is covered with moisture-resistant paper, and the outer box is then formed. *The Delta saw has been in use well over four years; maintenance—none.*



Delta Saws Solve A Crating Problem
. . . for **Cleaver-Brooks Company, Milwaukee, Wisconsin**

Problem: Steam boilers—massive yet delicate equipment, ranging from 15 to 500 HP and up to more than 40,000 pounds—are subjected to excessive jolting and to long exposure to elements during transit by rail and overseas. Costs of crating to provide complete protection were extremely high . . . **Solution:** Working from blueprints and precutting by two Delta saws—a 12" tilting arbor saw to cross-cut, rip and miter-cut lumber from crating boilers of various sizes, and a 20" band saw to cut inner bracing and support members.
Result: *An immediate big slash in crating costs.*

Delta Radial Saw Has Paid for Itself Many Times
. . . for **California Valencia Juice Co., Chicago, Illinois**

"Our Delta radial saw cuts to length, rips, miters and double-miters the oak lumber used for partitions, sliding doors, work benches, cabinets, docks, and many other items. Using our own unskilled help, it takes less than the time needed to explain jobs to a carpenter," says Elmo Delgrano, owner. "We built hundreds of pallets for handling multi-case unit loads; 60" x 30" bottle trays; and 64" x 34" four-wheel trucks at $20 each for which we'd have to pay at least $60. *The saw costs $1.70 an hour to operate (including labor), has saved us countless hours, and has paid for itself many times over.*"

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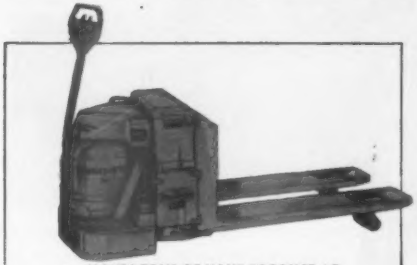
There's a Delta Power Tool for Your Job-

WOOD OR METAL WORKING

53 Machines • 246 Models • More Than 1300 Accessories

DELTA POWER TOOL DIVISION
DELTA MILWAUKEE **Rockwell**
MANUFACTURING COMPANY
619D E. VIENNA AVE. • MILWAUKEE 1, WISCONSIN

with the GREATEST $$$ SAVER American Industry Ever Knew... in Materials Handling Operations



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Forward and reverse control buttons are two-speed . . . controls operate from any position. Release of handle applies positive mechanical safety brake.

NEW "ARMORED" POWERHEAD DEFIES DESTRUCTION

All operating parts of this new electric truck are "armored" against shocks and bumps, by a heavy cast powerhead housing . . . yet easily accessible for quick servicing.

NOW SO COMPACT IT TURNS WITHIN ITS OWN SHADOW

"101" TRANSPORTERS are designed for utmost maneuverability. They slip in and out of the tightest aisles. These new "101" TRANSPORTERS turn within their own length.

NEW MOTOR—SAME SIZE, BUT 20% MORE EFFICIENT

New field-tested motor has been stepped up to deliver 20% greater efficiency. This means lower current consumption—more ton miles per KWH.

No wonder there are more Automatic TRANSPORTERS in use today... than any other operator-led Electric Trucks!

Yes, every day . . . different American Industries everywhere, report material handling savings up to 75%!

Small wonder management is so enthused about cost-cutting "101" TRANSPORTERS. These mechanized cost savers not only speed production and boost shipments—they also eliminate back-breaking, old-fashioned hand handling—*actually release manpower for more productive work*! It doesn't matter whether you employ as few as 3 men in materials handling operations, the rugged "101" Transporter will save you money. Send for the facts today—mail coupon below!

"101" Transporter
A PRODUCT OF AUTOMATIC
Lightens LIFE'S LOADS

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Please send me complete facts about your new "101" TRANSPORTER, with FREE booklet: "How to Make Your Material Handling Pay Dividends."

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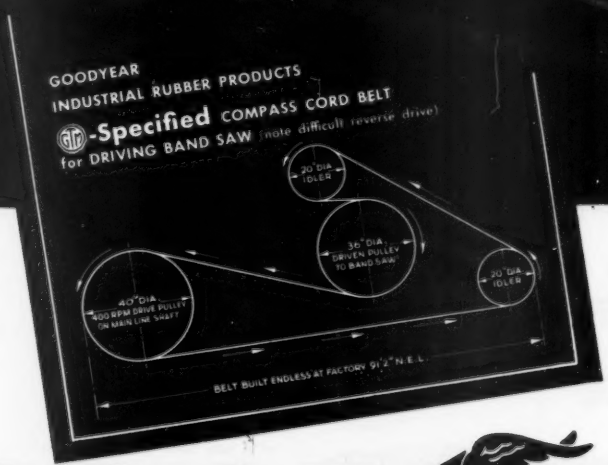
Service doubled

at ⅔ the belt cost

ORDINARY belts on band-saw drive stretched, caused shutdowns and lost production—failed completely after 6 years.

The G. T. M.—Goodyear Technical Man—specified COMPASS CORD belt built with single ply of load-carrying cords. COMPASS has served 13 years so far—still looks good for more service.

The COMPASS belt has never been touched since application—has saved at least $400 to $500 thus far.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INDUSTRIAL RUBBER PRODUCTS
-Specified COMPASS CORD BELT
for DRIVING BAND SAW (note difficult reverse drive)
20" DIA. IDLER
36" DIA. DRIVEN PULLEY TO BAND SAW
40" DIA. 600 RPM DRIVE PULLEY ON MAIN LINE SHAFT
20" DIA. IDLER
BELT BUILT ENDLESS AT FACTORY 91'2" N. E. L.

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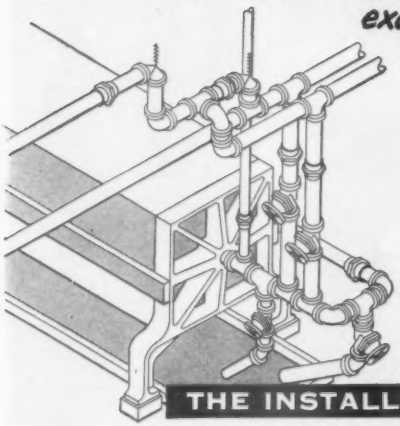
We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network

Compass—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Do Your Valves Last This Long?

...on Semi-Solids, for example



THE INSTALLATION

Crane Packless Diaphragm Valves handling liquid clay to filter presses. Onondaga Pottery Co., Syracuse.

VALVE SERVICE RATINGS

SUITABILITY: Fluid can't get into working parts

MAINTENANCE COST: None yet – Big savings indicated

CORROSION-RESISTANCE: Excellent

SERVICE LIFE: 5 times longer already – no sign of wear

OPERATING RESULTS: No interruptions – Easier operation – Lower cost

PRICE: Good

AVAILABILITY: Stock item – Crane

THE HISTORY

Plug cocks were used in this service before replacing with Crane Diaphragm Valves. But the cocks lasted no more than 2 to 8 weeks. They quickly cut out at the plug and body, damaged by the gritty particles and highly erosive effects of liquid clay at 140 psi. pressure.

After 11 months' uninterrupted service, Crane Diaphragm Valves showed no significant wear or damage resulting from normal operating conditions. They sharply reduced maintenance and replacement costs over plug cocks, and were approved as standard equipment on filter press piping.

THE VALVE

In Crane Iron Body Packless Diaphragm Valves, the Neoprene diaphragm acts as bonnet seal only; is not subject to crushing and rapid wear. Separate disc with Neoprene insert shuts off flow even should diaphragm fail. Choice of fully Neoprene lined or unlined valves. Highly recommended for many common and corrosive services; sludges, slurries, etc. See your Crane Catalog or Crane Representative.

The Complete Crane Line Meets All Valve Needs. That's Why

More Crane Valves Are Used Than Any Other Make!

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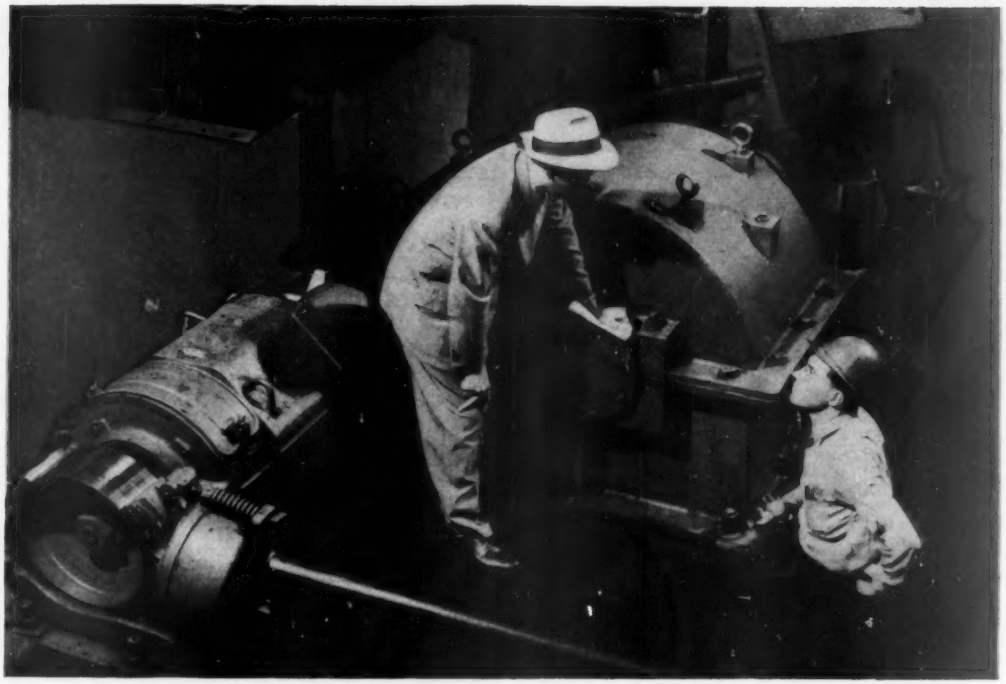
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

PROTECTION PLUS *for gears and drives* —GULF E.P. LUBRICANTS



Gulf E. P. Lubricants are specially compounded to withstand the shock loads and high pressures encountered in the toughest steel mill service. Their extra load-carrying capacity is more than ample to protect any well-designed gear. They prevent excessive wear, keep maintenance costs low.

Gulf E. P. Lubricants are also outstanding in their ability to separate from water—an important consideration in many steel mill gear drives. In a recent investigation of extreme pressure lubricants, all grades of Gulf E. P. Lubricants were found to be definitely superior in this respect. This means that with the proper grades of Gulf E. P. Lubricants and good maintenance practice, lubrication difficulties caused by water can be minimized.

Gulf E. P. Lubricants have other qualities that help insure trouble-free gear drive performance and lower maintenance costs: wide range of viscosities, nonfoaming, tenacious, stable, noncorrosive, rust preventive.

For specific recommendations for your equipment—and for expert help an any problem that involves lubricants or lubrication—call in a Gulf Lubrication Engineer today. Write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company
Gulf Building, Pittsburgh 30, Pennsylvania

GULF INDUSTRIAL LUBRICATION

The Most Convincing Paint Story Ever Told...Can Be Told Right On Your Own Wall!

This paint story is something you should hear. It's something you owe to yourself to SEE. For it can save you real money in maintenance painting costs — *and give you a better paint job to boot!*

It's the Barreled Sunlight "economy-through-quality" story — *told right on your own wall* by means of the famous Barreled Sunlight "on-the-wall" test.

Alert maintenance and operating men who have tried this eye-opening test are now saving real money and getting better, longer-lasting paint jobs. Your Barreled Sunlight representative will be glad to arrange and supervise one right in your plant and at your convenience.

If you're interested in saving money . . . in learning how to figure true painting costs . . . let him tell you *and show you* the Barreled Sunlight story. We know you'll find it the most interesting and convincing paint story ever told. Write, and he'll call.

BARRELED SUNLIGHT PAINT COMPANY, 2-D Dudley St., Providence 1, R. I.

Barreled Sunlight® Paints

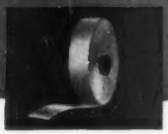
In whitest white or clean, clear, wanted colors, there's a Barreled Sunlight Paint for every job

IT ALWAYS COSTS MORE NOT TO PAINT!

For over half a century the symbol of quality and dependability among paint buyers for leading industrial, institutional and commercial buildings

America's blue ribbon companies prefer *Blue Ribbon* tape

Megowen-Educator, makers of the well-known Crax crackers, seal their shipments against dust and odors with Blue Ribbon Superstandard Gummed Tape.



"Blue Ribbon has no offensive odor"

—says Megowen-Educator Food Co.

"Our shipping department is completely sold on Blue Ribbon because it has no offensive odor. Furthermore, since we package food we are doubly anxious to keep any foreign odors away from our products. Blue Ribbon has no strong odor to contaminate our shipments. Customers' good will has been strengthened through our use of Blue Ribbon tape.

"We are convinced that the high quality of our product must be reflected in the appearance of its taped carton. Colored, printed Blue Ribbon gives our packages eye appeal. Blue Ribbon's fast, permanent adhesion and its strong kraft insures the attractiveness and strength of our cartons, until they reach our customers' doorsteps."

—Megowen-Educator Food Co.

Blue Ribbon **SUPERSTANDARD GUMMED TAPE**

Available plain or printed, in choice of widths, weights, lengths and colors

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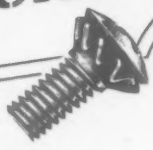


AMERICAN

PHILLIPS Sems* Assemblies

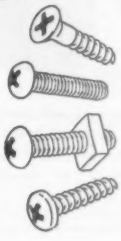
Save Time...Cut Costs...

Improve Quality

Pre-Assembly of washer and screw provides an easier and faster means of assembling parts that require lock-washer protection under each screw head. And this sets up a chain of savings that begins with ordering and extends through stocking, inventory, handling, and assembly. In driving, all waste-motion is eliminated, for there is no fumbling and fitting of washer to screw. And American Phillips driving is *automatically straight driving*, so product quality is protected . . . while spoilage and lost material are held down to the vanishing point.

American Phillips Sems* Assemblies are still another type of fastening that makes American one of the world's most complete lines of screws. Now add American's modern mass-production facilities and quality control, and you've got *three* good business reasons why it always pays to "Buy American."

*U. S. Patents Nos. 2,113,424 and 2,113,425



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PHILLIPS HEADquarters

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Westsorb

VIBRATION-ABSORBING MACHINE MOUNTS

Elimination of vibration in power-driven machines invariably increases their production.

Westsorb Felt Machine Mountings are easily installed, engineered to every job, low in price and are serving on hundreds of different manufacturing jobs.

Westsorb mountings will not break down under extended impact loads. They resist oil, grease, acid, age—do not ravel or fray. Three degrees of hardness and thicknesses meet every requirement. Adhesive coating both sides makes bolts and floor holes unnecessary.

Westsorb is the ideal mounting for stepping up the wheels of industry.

Western Felt engineers in principal cities are anxious to cooperate in solving your vibration problems.

Westsorb Vibration-absorbing Machine Mounts

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- Lower Machine "down-time"
- Simplifies Installation
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- Engineered for Each Job

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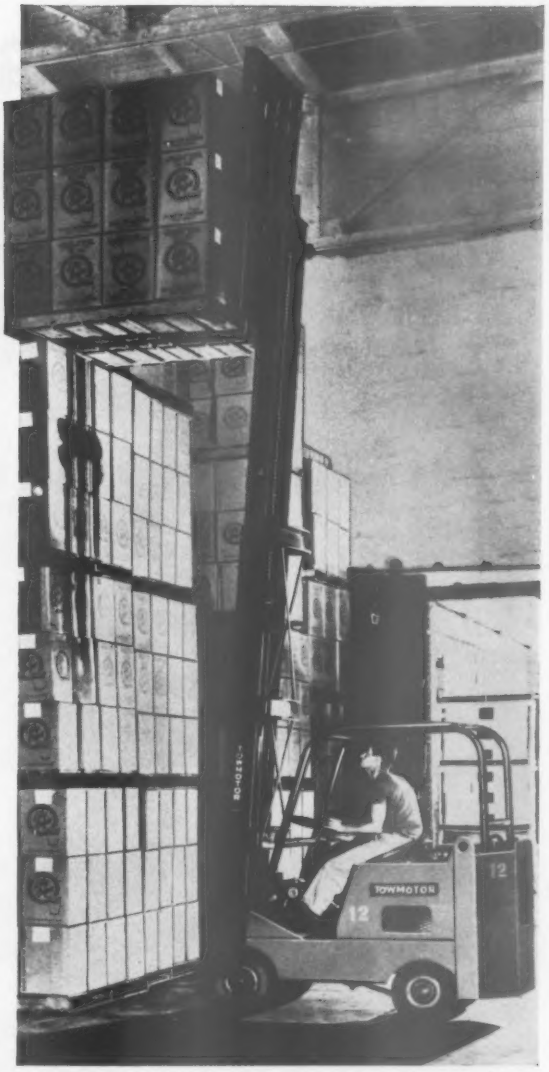

Towmotor-engineered for peak performance 24 hours a day

From the top of this 20-ft. ceiling-high reach, right down to the floor, every inch of Towmotor is engineered for peak performance. That means *power* to lift and transport full rated loads all day long; *tireless stamina* to assure trouble-free operation for years; and *rabbit-like agility* to zip in and out of tight spots swiftly and effortlessly.

But see for yourself WHY Towmotor engineering assures *you* of lowered costs in every job of Receiving, Processing, Storage and Distribution. Write for the illustrated booklet "What Makes It Tick?" —the inside story of Towmotor. Towmotor Corporation, Div. 5, 1226 E. 152nd St., Cleveland 10, Ohio. Representatives in all principal cities in U.S. and Canada.

Available on request, "What Makes It Tick?" describes 24 famous Towmotor engineering features.

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14 Towmotor models easily handle loads from 1,500 to 15,000-lbs.—a Towmotor for every job . . . your job.

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really good enough, today?

Chances are good that if you've been using the same method for a mere two years, there's now a better way. That's how thick and fast the new developments in abrasive techniques have come along. Every day someone, somewhere, is switching from one method to another, under the pressure of one hard economic fact: the need to cut costs.

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Make a mental run-down today of each abrasive operation your shop performs, then call in the man from CARBORUNDUM for his experienced, practical, unbiased counsel. You'll find him listed in the yellow pages under "Abrasives." Call him today—it's to your profit!

Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM

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offers ALL abrasive products...to give you the proper ONE

SURE CURE

SQUARE D's MATCHING KNOCKOUTS

for faster, easier, neater GANGING
...no time-consuming conduit bending
—an EXCLUSIVE feature of Square D safety switches—
circuit breakers—starters—contactors—auxiliary gutters

Bending conduit is a familiar scene when electrical devices of varying sizes and makes are being connected. This costly operation can't be avoided if conventional concentric knockouts are used. The sketches show why.

WITH CONVENTIONAL CONCENTRIC KNOCKOUTS *BENDING* IS A "MUST"

Conventional concentric arrangement provides knockouts of various sizes, grouped around a common center, which must be positioned far enough from the rear of the enclosure to permit installation of the largest conduit size. Therefore, the distance from the rear of the enclosure is variable, depending on the combination of knockouts in each cluster. The size of the cluster required changes with device rating.

Expensive—Unattractive!

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

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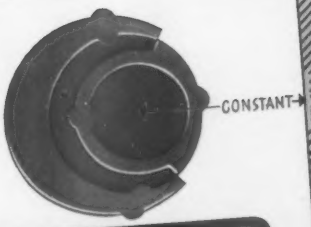
for the "BENDS"



WITH MATCHING TANGENT KNOCKOUTS —STRAIGHT, NEAT CONNECTIONS

Square D's new tangent arrangement provides ½"-¾" concentric knockouts with larger knockouts in a tangent pattern. The common center of the two smaller knockouts is a constant distance from the rear of the enclosure. This automatically positions the tangent pattern, thus insuring matching knockouts regardless of size of cluster or device rating.

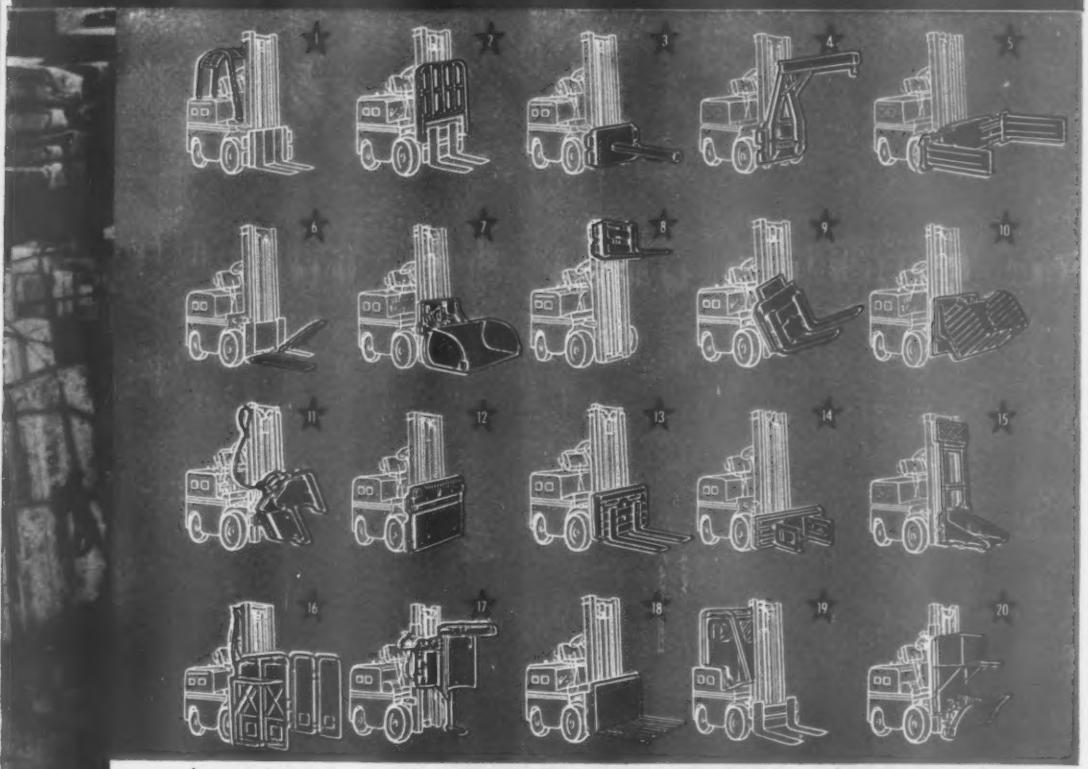
Economical— Attractive!

More good reasons for specifying Square D's electrical distribution and control equipment, straight across the board—less expensive to install and more attractive in appearance.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

"Hitch" Your CLARK Fork Trucks
Every CLARK fork-lift truck saves money—a lot of money—for its user. Some save more than others because they are used more effectively—more efficiently—more regularly. They aren't allowed to stand idle "in between jobs." Demountable CLARK attachments enable them to do at great savings many jobs outside the popular concept of materials handling (snow plowing, coal shoveling and plant maintenance work, for example), and to do more and better jobs within that concept. Let CLARK help you make the most of and get the most from your fork-lift trucks. For your profit's sake, talk over your handling operations with the CLARK Dealer nearest you—he's listed in the Yellow Pages of your telephone book.
CLARK

to These Star Attachments



1. **Overhead Guard**—protects the driver from falling objects
2. **Load Safety Rack**—provides secure backing for loads when truck is in motion
3. **Ram**—handles coiled strip, wire and other loads with center opening
4. **Crane**—handles items that cannot be palletized because of size, shape or weight
5. **Heavy-Duty Clamp**—sturdier in construction for handling heavy, bulky loads
6. **Fork Extensions**—for bulky or outsized loads that cannot be positioned on standard forks
7. **Shovel**—for handling loose, free-flowing materials in bulk
8. **Hi-Lo-Stack**—provides free lift of 62" or 64" (depending upon truck model) without increasing overall height of mast and without limiting maximum lift
9. **360° Rotating Device**—for handling containers to be dumped or inverted
10. **Pitch-Fork Shovel**—handles castings, forgings, coal, broken stone and other materials in aggregate
11. **Rotating Roll Clamp**—accomplishes 90° rotation of rolled paper and other materials from horizontal or vertical position
12. **Crate Handler**—finger-lift mechanism eliminates pallets and forks in handling materials in slatted crates
13. **Side-Shifter**—shifts loads 3" or 4" (depending upon truck model) to right or left for quick and accurate positioning
14. **Cotton Clamp**—handles bales of all types in many different combinations
15. **Clamp-Lift**—lifts, carries and tiers boxes, crates, barrels and rolls
16. **Carton Clamp**—eliminates need for pallets in handling many materials packed in corrugated and fiber cartons
17. **Barrel Device**—handles paper rolls and other cylindrical items with hollow cores
18. **Brick Forks**—pick up, carry and tier unit loads of brick, concrete blocks, etc., without pallets
19. **Cab**—provides full protection for driver in outdoor operations
20. **Snow Plow**—designed exclusively for snow removal—not for bulldozing

CLARK ELECTRIC AND GAS POWERED **FORK TRUCKS**

AND POWERED HAND TRUCKS · INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 12, MICHIGAN

Please send: ☐ Basic Facts Book, ☐ Condensed Catalog
☐ Material Handling News ☐ Have Representative Call.

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FUEL FOR THE FLAMES OF FREEDOM

There's an encouraging glow in the skies over America. Day and night the nation's mighty furnaces of production are turning iron ore and scrap into steel. *Steel*—for ships, planes, tanks, guns . . . *steel* for the thousand and one needs of a civilian economy.

36,000,000 TONS OF SCRAP...

That's what it's going to take—this year—to keep those furnaces hot . . . to produce the steel to meet the imperative requirements of a free people in a troubled and uncertain world.

WHERE IS THIS SCRAP?...

It's everywhere! It's every sizable bit of idle metal . . . old machines and equipment . . . obsolete tools, implements, dies, jigs, fixtures . . . outmoded structures, gears, valves, wheels, pulleys . . . anything and everything that can be salvaged for conversion into new steel.

WHAT WE MUST DO...

Remember: steel is made half from pig iron, half from scrap. Every furnace that is allowed to cool—for lack of scrap—means lost manpower, reduced productive capacity, less of the material to keep our economy healthy, and our defense strong.

Every man, woman and child in America has a stake in steel. We've got to ferret out this idle scrap . . . and keep it flowing, day after day, into the nation's mills. "We must not—we cannot . . ." as Charles E. Wilson, Director of Defense Mobilization has so succinctly said, "let America's furnaces cool down."

THE AMERICAN INTER-COM SYSTEM

Historically—in their basic function as the nation's all-seeing, all-hearing and reporting Inter-Communications System—America's business magazines have demonstrated their effectiveness as disseminators of vital information in times of emergency.

So, again today, cooperating with The Steel Industry Scrap Mobilization Committee and The Advertising Council's Steel Scrap Campaign, business magazines have pledged themselves to continue the job of reporting, stimulating, and directing attention to the urgent need for metal scrap.

And—in times like these—it is heartening to know that, *no country or combination of countries in the world has a business press that can compare in size, character, or ability to serve with that of America.*

McGRAW-HILL PUBLISHING COMPANY, INC.

330 WEST 42nd STREET, NEW YORK 36, N. Y.

HEADQUARTERS FOR BUSINESS INFORMATION

Drop Forged SteelS

W-S Screw-End and Socket-Weld Fittings

That's right, W-S emphasizes the *plural* when it comes to the various steels for forged fittings.

From Monel down to the full range of carbon types, including low sulphur and phosphor-controlled grades, W-S *forged* fittings spark the trend toward specialized materials for specialized needs.

What's your problem? STRENGTH? W-S is a leading supplier to the high-pressure, high-temperature power industry. CORROSION? W-S stainless and alloy fittings tie America's main arteries of chemical production. SANITATION? W-S is a big producer of the popular Type 304 for food and pharmaceutical operations. Low temperature? Another W-S specialty.

And there's one problem common to all . . . COST. Let us show you how W-S *forged* fittings provide the lowest *service* cost obtainable.

9-M-2

• **Stronger** • **Smaller** • **Lighter** • **Tighter**
• **More Uniform** • **Lower *Service* Cost**

SOLD THROUGH LEADING DISTRIBUTORS . . . EVERYWHERE

WATSON-STILLMAN
ESTABLISHED 1848

DISTRIBUTOR PRODUCTS DIVISION
ROSELLE, NEW JERSEY

Designers and Manufacturers of Forged Steel Fittings, Wire Rope Shears, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

Why *Maintenance Men* Favor the Allen-Bradley SOLENOID STARTER

ACCESSIBLE TERMINALS
Front connected—easy to get at. Ample space for motor and control wiring. Lots of knockouts.

NO CONTACT MAINTENANCE
Double break, silver alloy contacts never need filing, cleaning, or dressing for perfect operation.

ONLY ONE MOVING PART
One-piece plunger has no bearings to stick, no pivots to corrode. Simplicity means precision.

RELIABLE OVERLOAD RELAYS
Two eutectic solder relays give dependable overload protection. Accuracy unaffected by age.

AMPLE WIRING SPACE
Cabinets generously proportioned to provide ample space for wiring. No skinned knuckles.

WHITE INTERIOR
Enclosures have white enameled interiors for visibility in dark corners and easy installation.

COMPLETE LINE
The Allen-Bradley line includes all sizes from Size 0 to Size 7 in all NEMA types of enclosures.

When maintenance men, electrical contractors, and plant engineers were asked, in several independent surveys—"What make do you consider *first* when specifying motor controls?"—they consistently said—"We prefer Allen-Bradley." Why? Because Allen-Bradley starters are so simple. There are no gimmicks like pins, pivots, levers, or linkages to gum up and stick. There is no contact maintenance, so you can install Allen-Bradley starters and forget them. Allen-Bradley starters are *first* because they are so trouble free.

A-B Quality

ALLEN-BRADLEY

BULLETIN 709 SOLENOID STARTERS

AVAILABLE IN *Three* HANDY FORMS

START-STOP BUTTONS in cover for 2-wire pilot control

FORM 1 with Start and Stop push buttons for machines where the starter can be located conveniently near the operator.

WITHOUT BUTTONS in cover for 2- or 3-wire pilot control

FORM 2 with plain cover for machines where starter must be operated by remote push buttons or limit switches.

3-WAY SELECTOR SWITCH in cover for 2- or 3-wire pilot control

FORM 3 with Hand-Off-Auto 3-way selector switch for air conditioners, pumps, and other automatic machinery.

ALLEN-BRADLEY SOLENOID STARTERS

in Enclosures for Every Type of Industrial Service

Machinery designers who realize the importance of selecting the right enclosure for each application are specifying Form 1 enclosures with Start and Stop push buttons for many machines, thus reducing the installation cost of control wiring. For machines requiring manual as well as automatic control, they use the handy Form 3 enclosure. All starters are available in a variety of NEMA type enclosures to meet any service requirement. For full information, let us send you the Allen-Bradley Handy Catalog.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wisconsin

Allen-Bradley starters are available in various standard NEMA type enclosures.

2-52-MR

A-B Quality

ALLEN-BRADLEY

SOLENOID STARTERS

QUALITY

BAD AIR IS COSTLY...

... as compared to the blower that keeps air fresh

Your men can't produce at top efficiency when stagnant, hot or fume-filled air robs them of their energy.

Wherever bad air slows down production . . . in shipholds, tanks, drums, boilers or other places where men need fresh, cool air . . . a Coppus Blower becomes both a safety device and a production tool.

Portable and easily adaptable for special purposes, Coppus "Blue Ribbon" Blowers and Exhausters fit all your "fresh air" requirements. The Coppus "Blue Ribbon" means premium performance at ordinary cost. Check and mail the coupon for specific information. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG, BEST'S SAFETY DIRECTORY, MINING CATALOGS.

OTHER
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"BLUE RIBBON"
PRODUCTS

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Six frame sizes—
1 to 150 horsepower

VERTICAL TURBINE
Six frame sizes—
1 to 150 horsepower

FANMIX GAS BURNER

FANMIX GAS-OIL BURNER

MAIL THIS COUPON To Coppus Engineering Corp., 104 Park Avenue, Worcester 2, Mass.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fusilages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets; etc., after treated with coating material.

NAME .....

COMPANY .....

ADDRESS .....

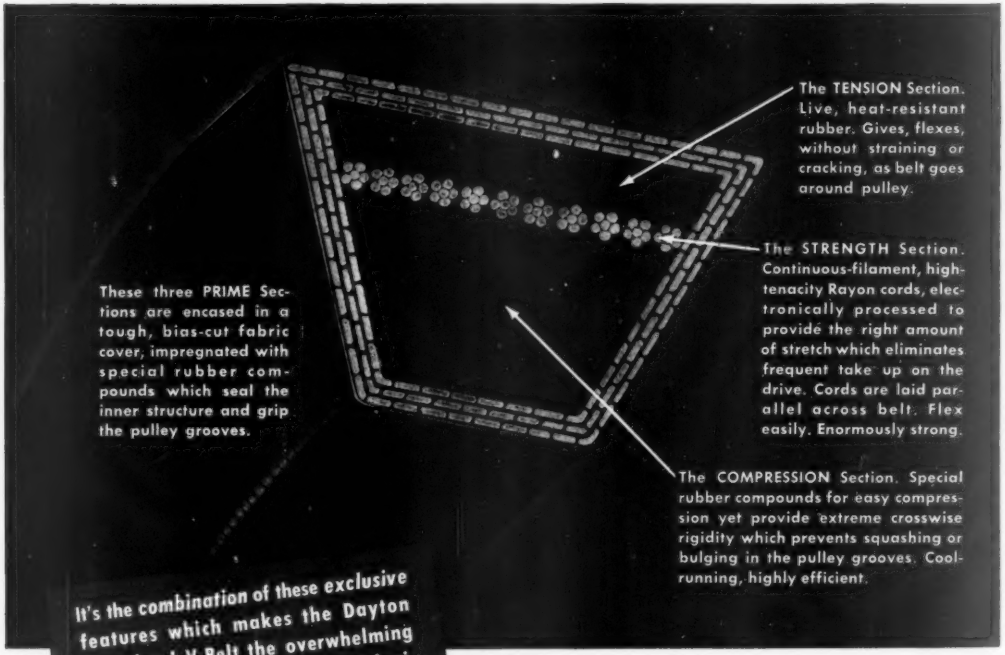
CITY .....

(Write here any special ventilating problem you may have.)

The Dayton "TWINS" will

"I'm Thorobred"—the universal V-Belt for use on regular-diameter pulleys!

Cut costs? Yes, you'll *slash* them if you use Dayton Thorobred V-Belts for *all* of your regular power drives! You'll cut your power costs because you'll get *more* of the power on the driven machine! You'll cut V-Belt maintenance expense and at the same time *reduce* costly "downtime!" And most important of all—your V-Belt dollar will go farther because Dayton Thorobred V-Belts last longer, *much longer!* You'll get all these benefits because Dayton Thorobred V-Belts, made by the *originator* of V-Belts, are more *flexible*, much *stronger*, more *stretch-proof*, and run more smoothly and quietly without overheating. For the reasons WHY, see these *exclusive* Dayton features . . .


The TENSION Section. Live, heat-resistant rubber. Gives, flexes, without straining or cracking, as belt goes around pulley.
The STRENGTH Section. Continuous-filament, high-tenacity Rayon cords, electronically processed to provide the right amount of stretch which eliminates frequent take up on the drive. Cords are laid parallel across belt. Flex easily. Enormously strong.
The COMPRESSION Section. Special rubber compounds for easy compression yet provide extreme crosswise rigidity which prevents squashing or bulging in the pulley grooves. Cool-running, highly efficient.
These three PRIME Sections are encased in a tough, bias-cut fabric cover, impregnated with special rubber compounds which seal the inner structure and grip the pulley grooves.

It's the combination of these exclusive features which makes the Dayton Thorobred V-Belt the overwhelming choice of leading industries and businesses for general purpose power transmission drives . . . for more power in longer service at lower cost! It will give all that to YOU!

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Your choice, between Dayton Thorobred V-Belts and Dayton Cog-Belts,* will ALWAYS depend only on the KIND of power application you need. Either belt will give the BEST results in its proper place. Get in touch with your Dayton Distributor . . . a V-BELT EXPERT! He's listed in your telephone directory under "Belting."

cut your V-BELT costs!

"I'm Cog"—for small pulleys, short centers, high speeds . . . all special power requirements!

You'll slash costs even more with Dayton Cog-Belts!* Specially designed and built for the heavy-duty requirements of high speeds, small pulleys, short centers, compact drives, they deliver 40% MORE POWER than conventional V-Belts. See (right) how a Dayton Cog-Belt* bends as naturally as your finger, how cogs close as the belt bends around the pulley. This greater flexibility demands less power, prevents overheating, *without* sacrificing strength or long life. Look at these *exclusive* features which assure much better service from Dayton Cog-Belts* . . .

*T. M.

The TENSION Section. Multi-layer, bias-cut, rubber-impregnated fabric which flexes easily around the smallest pulleys.

The STRENGTH Section. Prestretched Rayon cords, electronically processed, laid precisely parallel across the belt. These specially processed cords flex more easily yet have enormous tensile strength.

The COMPRESSION Section. The Cogs. Built-in, preformed, accurately shaped and spaced, with flat bottoms for V-Flat drives. Transverse fibers give great crosswise rigidity, preventing squashing or bulging, *without* decreasing longitudinal flexibility required by small pulleys.

DIE-CUT raw edge sides, an exclusive Dayton feature, precisely angled. They provide the maximum coefficient of friction, the most powerful grip, between belt and pulley grooves.

40% MORE POWER! Dayton Cog-Belts* deliver 40% more power, size for size, than any conventional V-Belt. Usually 5 will do the work of 7 ordinary V-Belts. Fewer and shorter belts, shorter centers, more compactness. A BIG SAVING in heavy-duty power applications.

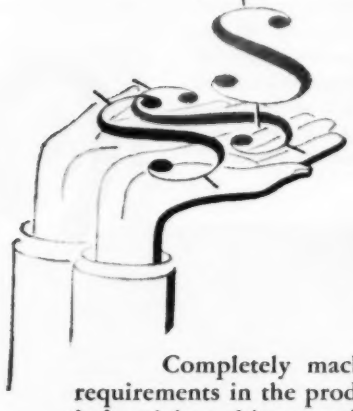
DAYTON RUBBER COMPANY • DAYTON 1, OHIO

V-Belts by Dayton Rubber

Since 1905

WORLD'S LARGEST MANUFACTURER OF V-BELTS

Money SAVING!



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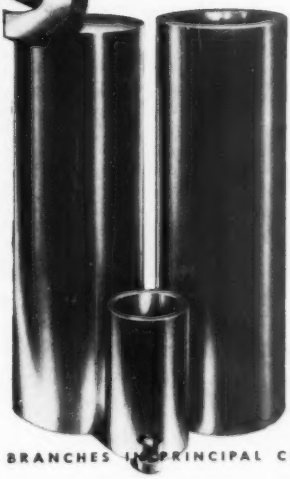


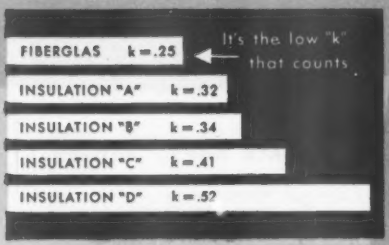
THE BUNTING BRASS & BRONZE COMPANY • TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

IN THIS INSTALLATION

Fiberglas* PF Pipe Insulation was applied on straight runs . . .

Valves and irregular surfaces were insulated with Fiberglas Aerocor* . . .

. . . and finished with Fiberglas Insulating Cement



Save up to 25% more BTU's per dollar with Fiberglas PF Pipe Insulation

It's the "k" that counts. Fiberglas* PF Pipe Insulation is first in efficiency among molded materials for service up to 450° F. As the little chart above shows, the low heat conductivity "k" of Fiberglas Insulation gives superior protection when equal thicknesses are used . . . or, in many cases, you can use less thickness than with other insulations to obtain equal protection. Either way your costs are lower.

Fast, easy application is another way Fiberglas PF saves money. Available with canvas jacket for indoor use, or with weatherproof jacket for outdoor. *New form* is Fiberglas Dual Temperature Pipe Insulation. Its jacket of laminated aluminum foil and kraft paper provides an integral vapor barrier for indoor lines that carry hot water one season and cold water another; or for continuous low-temperature service.

Where heat or cold must be controlled, count on these unique features of Fiberglas Industrial Insulations to produce top results . . . in less time, at lower cost:

- High insulating value
- Light, easy to apply
- Economically priced
- Non-combustible
- Ageless, rotproof
- Non-corrosive
- Low moisture pickup
- Dimensionally stable

Your Fiberglas Insulation Contractor is ready to put these advantages to work for you. For his name, phone the nearest Fiberglas Office. Or write OWENS-CORNING FIBERGLAS CORPORATION, Dept. 85-D, Toledo 1, Ohio.

*Fiberglas (Reg. U. S. Pat. Off.) and Aerocor are trade-marks of Owens-Corning Fiberglas Corporation for products made of or with fibers of glass.

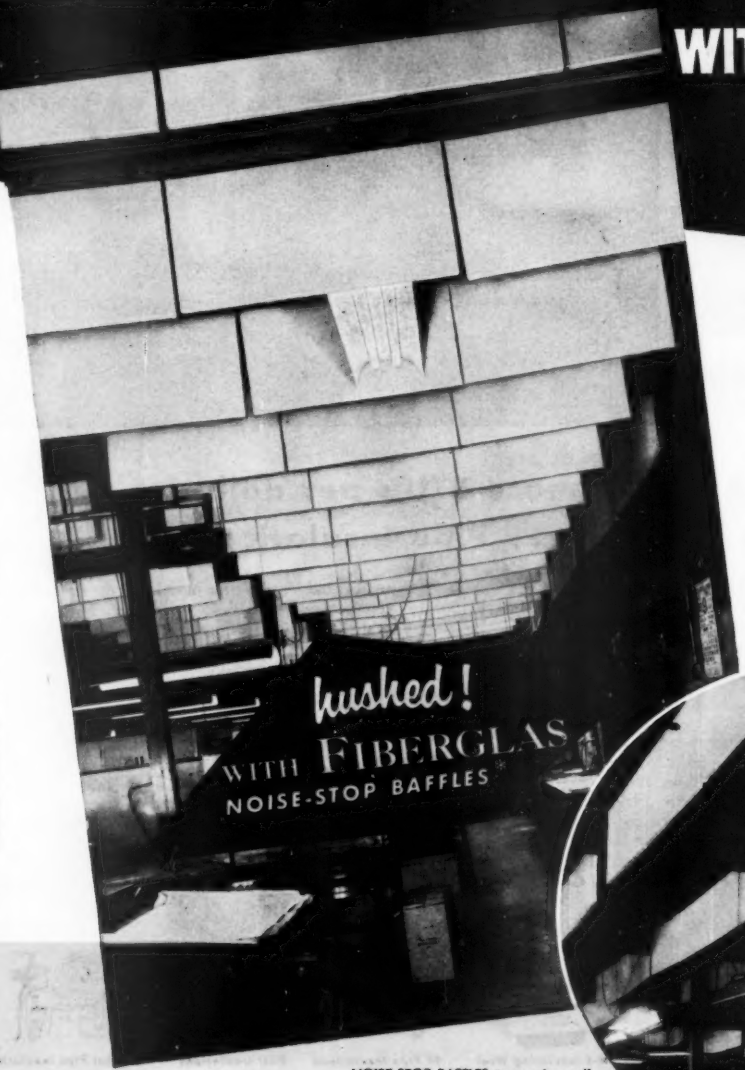
OWENS-CORNING
FIBERGLAS

INDUSTRIAL INSULATIONS

...Where Heat or Cold Must be Controlled!

NEW! Hush Annoying

WITH LOW-COST

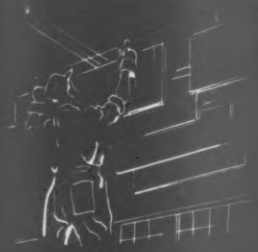


Check these benefits!

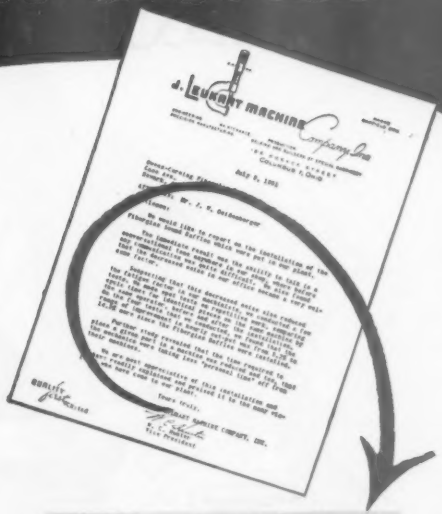
1. Make working conditions more comfortable
2. Reduce errors and spoilage
3. Produce more with less fatigue
4. Talk instead of shout
5. Avoid misunderstandings of instructions
6. Lessen "time out"
7. Lower distracting noise in adjacent offices
8. Increase over-all efficiency

NOISE-STOP BAFFLES trap noise well above ear level at J. Leukart Machine Co., Inc., Columbus, Ohio. Hourly output increased in range from 5.2% to 14.5% after installation.

Plant Noise



FIBERGLAS* NOISE-STOP BAFFLES



1 **NEW, LOW-COST SOUND CONDITIONING NOW AVAILABLE FOR INDUSTRIAL AREAS!**

Noise-Stop Baffles, newest addition to the complete line of Fiberglas acoustical products, offer a practical solution to the problem of annoying plant noise. Where cost has made sound conditioning of industrial areas prohibitive before, you can now reduce loudness effectively—at ⅓ to ⅓ the total cost of a standard acoustical ceiling.

2 **COMPLETELY ADAPTABLE...EASY TO INSTALL, MOVE AND MAINTAIN!**

Noise-Stop Baffles are 2′ x 4′ units of non-combustible Fiberglas acoustical board. The baffles are encased in a dust and lint-repellent plastic that makes cleaning, handling and maintenance easy. Noise-Stop Baffles are suspended from wires spaced to fit overhead conditions so they do not interfere with sprinklers, wiring, pipes, lighting, etc. Installation does not interrupt production and can be made easily and quickly.

3 **FAMOUS FIBERGLAS QUALITY THROUGHOUT!**

Noise-Stop Baffles are fire safe and will not support combustion. The plastic film casing is easily washed or vacuum-cleaned and has good light-reflection qualities. Light in weight—only 6 lbs. per unit—Noise-Stop Baffles are easily moved when desired, without loss of material. Resistant to moisture and humidity conditions.

If you are interested in substantial benefits in employee relations and measurable increases in efficiency, contact your Fiberglas acoustical contractor for an obligation—free Noise-Stop analysis and cost estimate. See the yellow pages of your phone book, or write to: Owens-Corning Fiberglas Corporation, Dept. 85-D, Toledo 1, Ohio.

Mr. W. C. Hunter, Vice President, J. Leukart Machine Co., Inc., Columbus, Ohio, writes:

"After four tests we found that the range of improvement in hourly output was from 5.2% to 14.5% more."

"Noise also reduced fatigue factor in our machinists."

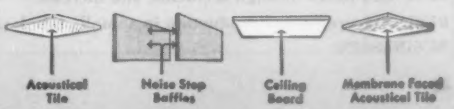
"The immediate result was the ability to talk in a conversational tone anywhere in our shop."

"Decreased noise in our office became a very welcome factor."

OWENS-CORNING
FIBERGLAS

*Fiberglas (Reg. U.S. Pat. Off.) and Noise-Stop are trade-marks of Owens-Corning Fiberglas Corp.

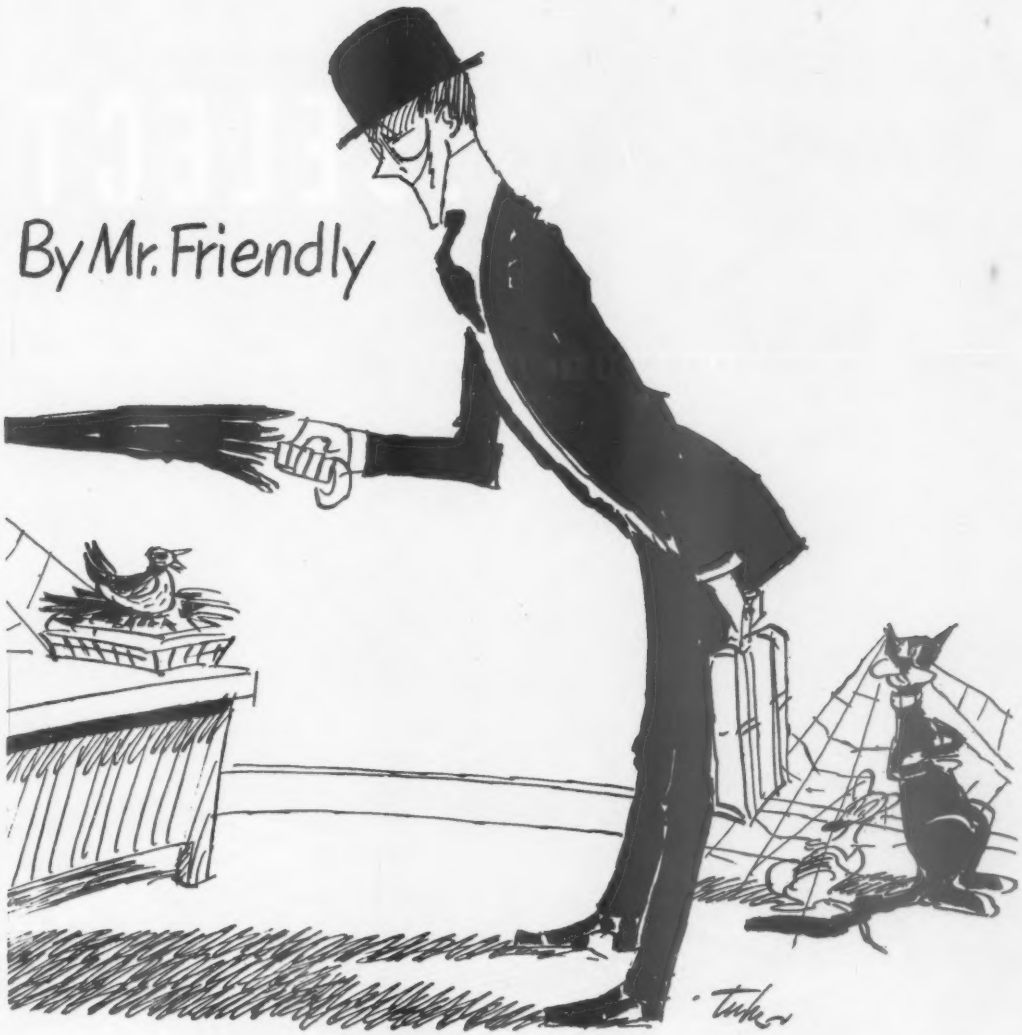
SOUND CONTROL PRODUCTS



BUSINESS has been our BUSINESS longer than any other BUSINESS in our BUSINESS! . . . (AN AD ABOUT BUSINESS)

BUSINESS men, I'm sure will agree that
BUSINESS insurance is a complex
BUSINESS that calls for plenty of
BUSINESS experience. And because we've specialized in
BUSINESS problems longer than any liability insurance
BUSINESS in America, we feel we're better equipped
to help your
BUSINESS prosper!
BUSINESS know-how has helped us to reduce
BUSINESS losses through accidents, and increase
BUSINESS profits and production in actually hundreds of
BUSINESSES!

BUSINESS know-how enables us to plan for your
BUSINESS special tailor-made programs designed
to fit specific
BUSINESS needs. And
BUSINESS executives will certainly welcome the important
BUSINESS savings, through dividends that we offer to all
BUSINESS policyholders! The point is . . . isn't it good
BUSINESS to do
BUSINESS with the first
BUSINESS in the
BUSINESS!



AMERICAN MUTUAL

...the first American liability insurance company

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MAIL THIS COUPON NOW – WITHOUT DELAY!

Dept. F-41, American Mutual Liability Insurance Company
142 Berkeley Street, Boston 16, Massachusetts

Without obligation, please *rush* me my *free* copy of *The Friendly Plan*, showing me how to save on practically every kind of insurance, except life. Also, a most helpful, free, illustrated 98-page book, *Foremanship and Accident Prevention in Industry*.

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YOUR LATHES

From the complete line of 76 models built in LeBlond's 11-acre plant

- 12" TO 50" SWING
- 4' TO 100' BED LENGTH

Here's your guide to better, faster turning by LeBlond. It describes LeBlond's complete line of lathes. Write today for Catalog H.

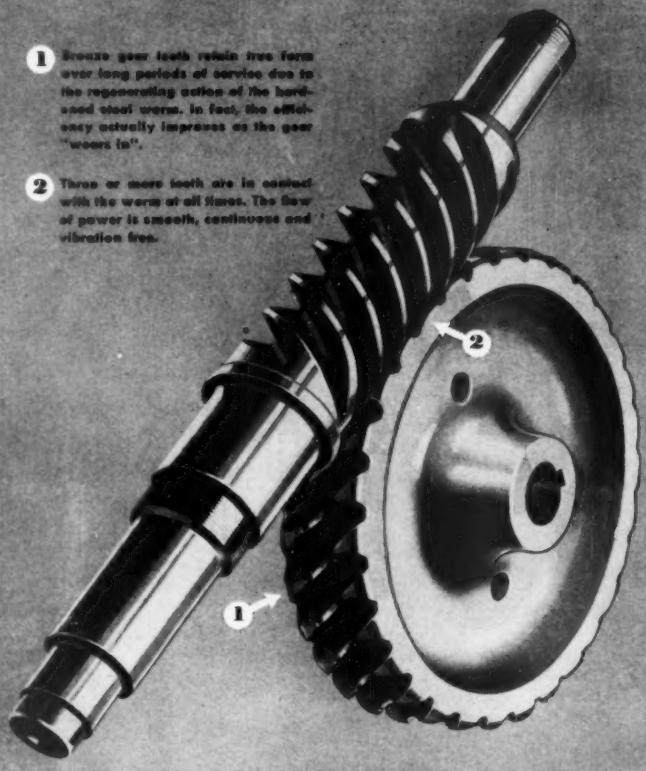
THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

LEBLOND of Cincinnati

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*

DE LAVAL WORM GEARING

precision-


1
Bronze gear teeth retain true form over long periods of service due to the regenerating action of the hardened steel worm. In fact, the efficiency actually improves as the gear "wears in".
2
Three or more teeth are in contact with the worm at all times. The flow of power is smooth, continuous and vibration free.
2
1

High Shock Load Capacity

De Laval worm gears can take "hard knocks". Gear teeth are under a crushing, instead of a bending load. Thus they withstand extremely high momentary and shock loads, which may damage other forms of gearing.

Standard 14½° involute spur gear tooth and old time worm tooth.

20° stub spur gear tooth.

De Laval Worm Gear tooth. Note, line of pressure falls inside of base of tooth.

For high productivity, the machine of the future must perform dependably, without breakdowns, with minimum maintenance. The design features shown above explain why De Laval heavy-duty worm gear speed reducers take punishment year-in, year-out . . . seldom require attention even under the most rugged operating conditions. They make a close-coupled, compact drive. High ratio reduction permits use of efficient, high-speed motors and turbines for driving many types of industrial machinery. De Laval builds all sizes, too . . . from 3″ to 30″ center distances for every type of application. Whatever you manufacture—if you use speed reducers—remember that De Laval Speed Reducers are . . . BUILT TO BE BUILT-INTO A QUALITY PRODUCT.

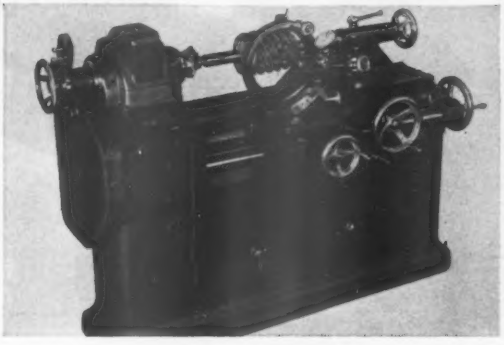
FREE Easy Selection Manuals

New De Laval Manuals G-WBV and G-WWH place at your fingertips valuable data on single and double reduction units. They contain complete selection data, hp rating tables and outline drawings . . . all set up in easy-to-use form. Write for your copies.

made for the machine of the future

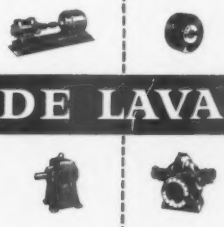
HEAT TREATMENT INCREASES WORM LIFE! Carefully selected alloy steel for worms is surface-hardened and heat-treated in controlled atmosphere, forced convection electric furnaces under modern metallurgical inspection and control. This heat treatment provides hard thread surfaces and most desirable core properties.

PRECISION GRINDING ASSURES ACCURATE THREADS! The most modern thread grinding machines available leave nothing to chance at De Laval. To obtain perfect contact between worm and gear, threads of worm are ground to correct lead and contour, using the master worm as a reference. Thousands of installations have proved these quality standards.



HOBS AND WORMS ARE PRECISION-CHECKED! The profile of the worm thread is compared directly with the master worm on this specially designed machine. This insures smooth, quiet, efficient operation. Use of De Laval master worms results in uniformity, correct thread thickness, precise tooth contour and interchangeability of parts.

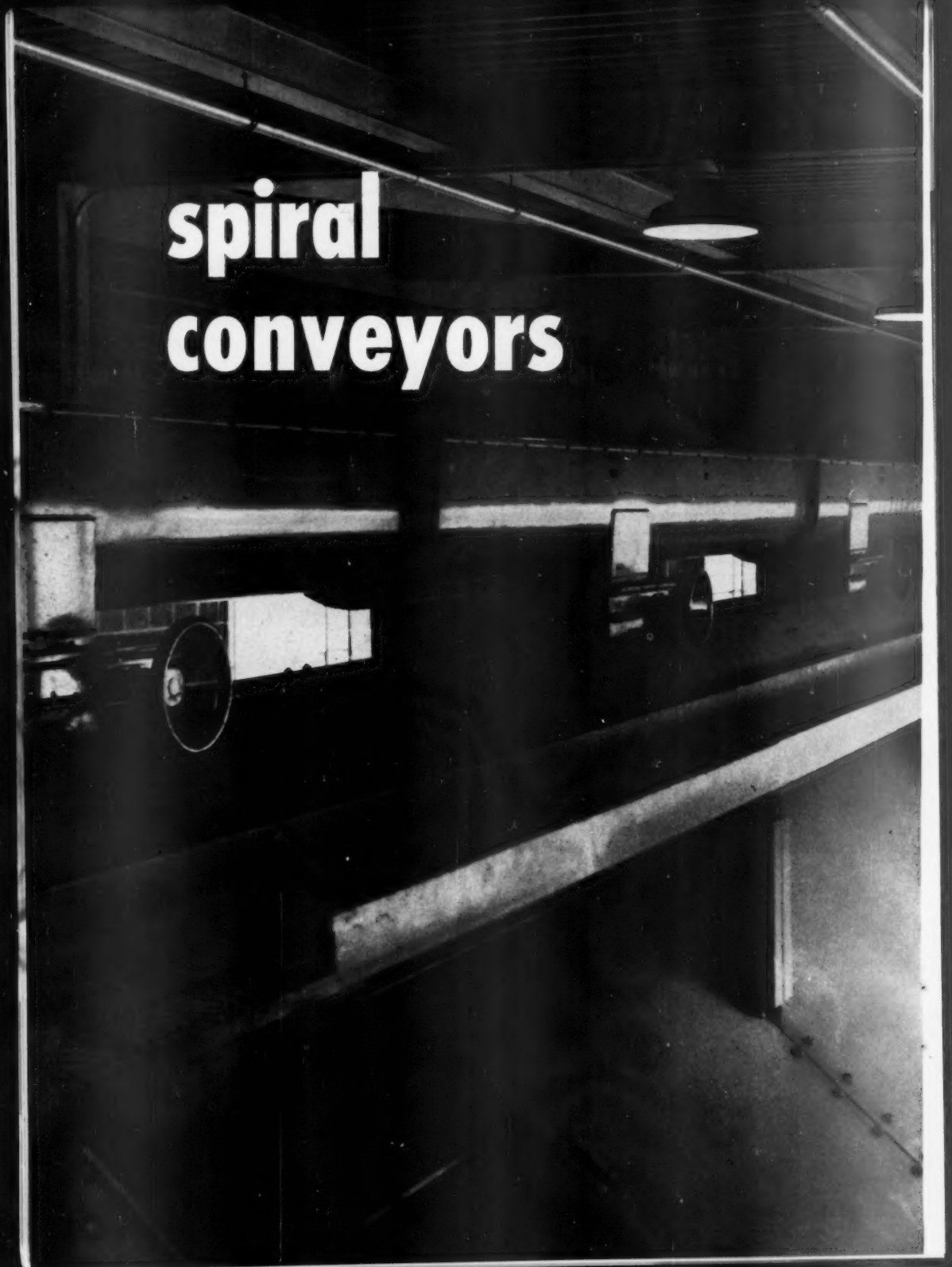
GEARS ARE HOBBED BY TANGENTIAL FEED PROCESS! In De Laval gears, the teeth are generated in bronze gear blanks by the tangential feed process, recognized as the most satisfactory method of producing worm gears. Hobs are designed and manufactured by De Laval to secure close control of quality, dimension and form.

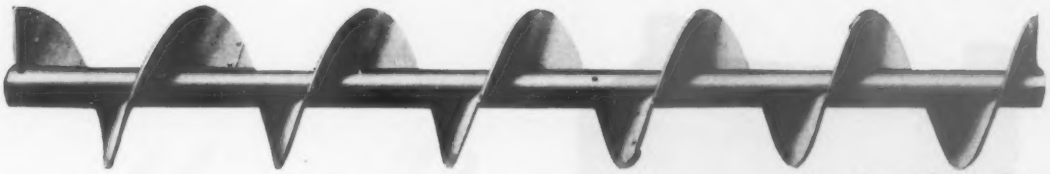


DE LAVAL *Speed Reducers*

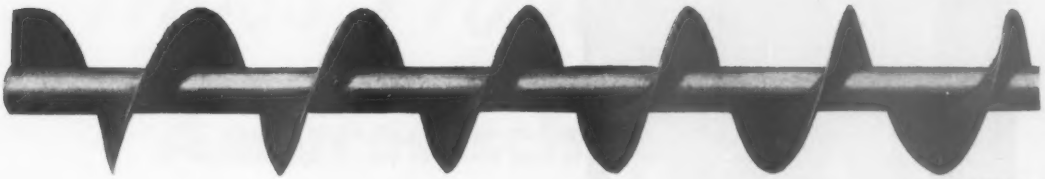
DE LAVAL STEAM TURBINE COMPANY
Trenton 2, New Jersey

DL.148


spiral
conveyors

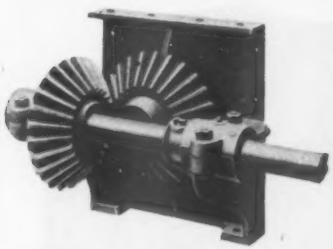


Sectional Conveyor Flight



Helicoid Flight

Plain trough end bearing (outside type) with feet. Babbitted bearings are standard. Bronze or other types of journal bearings can be furnished.



Open type countershaft end bearing. Can be furnished with driving gear and shaft extension at right or left. Babbitted bearings standard.

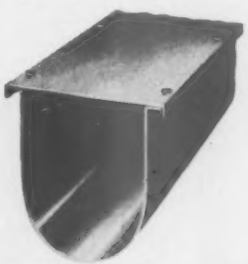
A COMPLETE LINE OF FLIGHTS AND ACCESSORIES

for New and Replacement Service

●

Catalog No. 803-B

No. 18-B Hanger for light and medium service. Various types available depending upon material, style of trough, temperature of material and volume to be handled



Section of standard steel conveyor trough showing cover with T-head bolts. Other types — with clamps or sand seals — available.

JEFFREY

1877 75 1952

ON
TRIPPED
OFF
TO RESET
OPEN COVER
Life-Linestarter
PAIRED FOR PRODUCTION
Life-Line motor
DO NOT LUBRICATE

Mass Production?

Assures schedules two ways

When motors—or their controls—go out, they usually go one at a time. One outage, though, may cripple an entire line. And whether you are producing spark plugs, automobiles or tanks, down time means lost production time. Take just a minute, then, to consider the extra "Life" features of Life-Line motors and Life-Linestarters®. They have the stamina to keep equipment operating under adverse conditions.

Consider the motor, for example. Heavy steel frame resists corrosion, vibration and physical shock. And inside? The wound stator is completely protected with multiple baked coats of tough thermoset varnish to cut outages from oil, moisture, dirt and heat.

And, too, Life-Line motors need no lubrication. Factory-sealed, pre-lubricated bearings reduce motor burnouts—no danger of over-or-under-lubrication as with conventional motors. Down time licked again.

Life-Linestarter, the Life-Line motor's rugged partner, provides positive protection on the toughest assignments. Designed specifically to meet the requirements of the Joint Industrial Committee of Automotive Manufacturers (JICAM), the combination Life-Linestarter in NEMA XII enclosure is provided with a dual-voltage primary transformer for operation on either 220 or 440 volts. The rubber-gasketed, no-knock-out enclosure excludes dirt, oil and splashing coolant.

Simple design, simple operation, mean fewer operating parts to foul. Seesaw action of clapper prevents accidental operation, kickout spring assures positive opening. The pace setter among starters, Life-Linestarter assures the dependable performance you need.

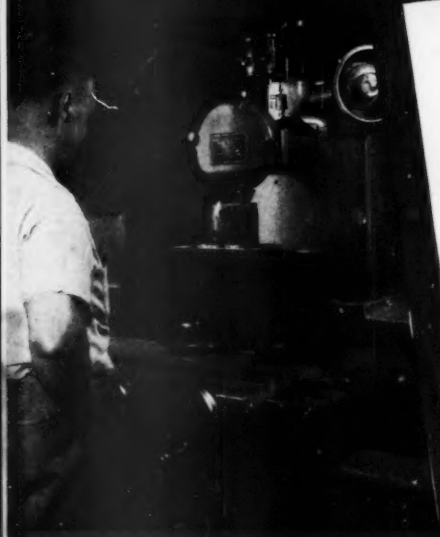
More data? Ask your Westinghouse representative for "Life-Line Motor Book" B-3842 and "Tomorrow's Starter Today" B-4677, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-21640

YOU CAN BE SURE... IF IT'S Westinghouse

Life-Line

MOTORS and CONTROLS

. . . CAN YOUR SURFACE



Rigid DoALL Surface Grinders Can Take Heavier Cuts and Produce Precision Work Faster

TRY THE TEST illustrated at the right. Take the heavy cut, reverse the crossfeed and let the wheel run back over the ground surface. If it sparks it is grinding again, showing that the wheel didn't take the full depth of cut on the first pass. If it is a DoALL Grinder it won't spark; in fact, if you stop the work under the wheel and shut off the motor the wheel will coast to a stop without touching the work surface.

Now, pencil mark the work surface. Lower the wheel .0001", start the grinder and the wheel will erase the pencil mark.

There is proof of the rigidity and precision of a DoALL Grinder! There is why it will do a given job in less time. You can take a heavier cut without "give" in the spindle or the table. The wheel doesn't climb over the work piece—it cuts true in one pass. There is no back-lash, slop or hang-up in the vertical column—you can control the vertical feed to lower the wheel as little as .0001" even after a heavy cut.

And, with DoALL "Cool-Grinding"* you can take full advantage of this rigidity and precision—take the heavier cuts without burning the work—get a better finish and sharper edges. Coolant flows in at the hub, *through* the wheel and out *at the point of contact* in a fine mist. There is always coolant where the heat is generated, unlike flood cooling where the wheel blasts the coolant away from point of contact.

There is a DoALL Surface Grinder with hand or hydraulic crossfeed for every toolroom or production requirement. Call your local DoALL Sales-Service Store today or write:

THE DoALL COMPANY

254 N. Laurel Ave., Des Plaines, Illinois

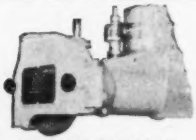
35 Local Sales-Service Stores in North America

* U.S. Patent No. 2470350. Available as extra equipment on all DoALL Surface Grinders.

GR-6

HERE'S WHY DoALL PRECISION HYDRAULIC SURFACE GRINDERS ARE FASTER, MORE RIGID, MORE ACCURATE!

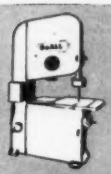
MASSIVE FRAME—column support and base are single-piece chrome nickel steel casting, strongly ribbed for great rigidity.



HUSKY SPINDLE SUPPORT, dowelled and bolted to column, prevents wheel from chattering or springing away from work.

VERTICAL FEED IN INCREMENTS OF .0001"—made possible by ridigity and precision of extra-long 30" column.

CONTOUR-MATIC



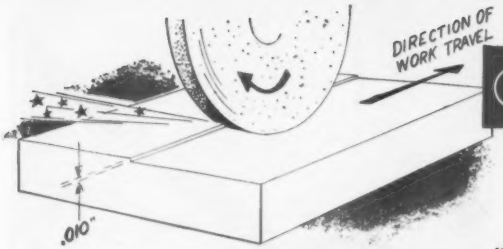
ZEPHYR

CONTOUR

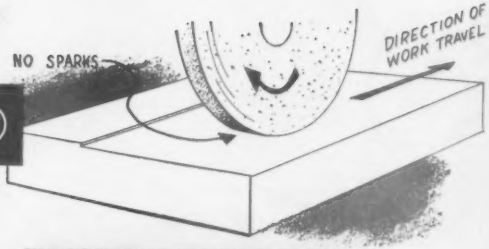
BAND FILER

SAW BANDS

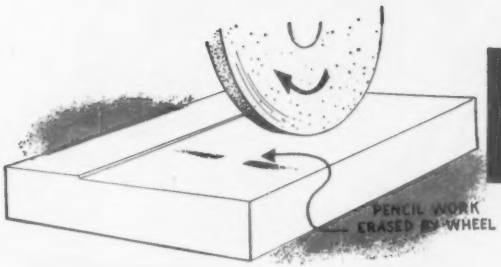
GRINDERS DO THIS?



1 Take a .010" cut with a .010" crossfeed in high chrome-high carbon steel.

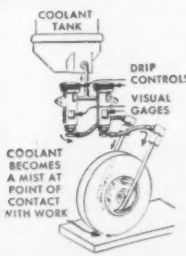


Run back over the same cut *with no spark out!* 2



3 Now lower the wheel just. 0001" using nothing but the calibrated hand-wheel, and erase a pencil mark on the work surface.

You can see the above test as part of a complete demonstration of a DoALL Precision Surface Grinder right in your own plant, without cost or obligation. Call your local DoALL Sales-Service Store today.



"COOL-GRINDING" ATTACHMENT—reduces cutting temperature as much as 400°F; prevents burning, warpage, checking, skin softness.

FULL HYDRAULIC *DRIVE* of table and cross-feed, *not* merely a hydraulic *control* of a mechanical drive. Smoother, longer-wearing, quieter; more uniform motion for smoother finish, greater precision.

DoALL

Ask for Descriptive

TOOLROOM GRINDER

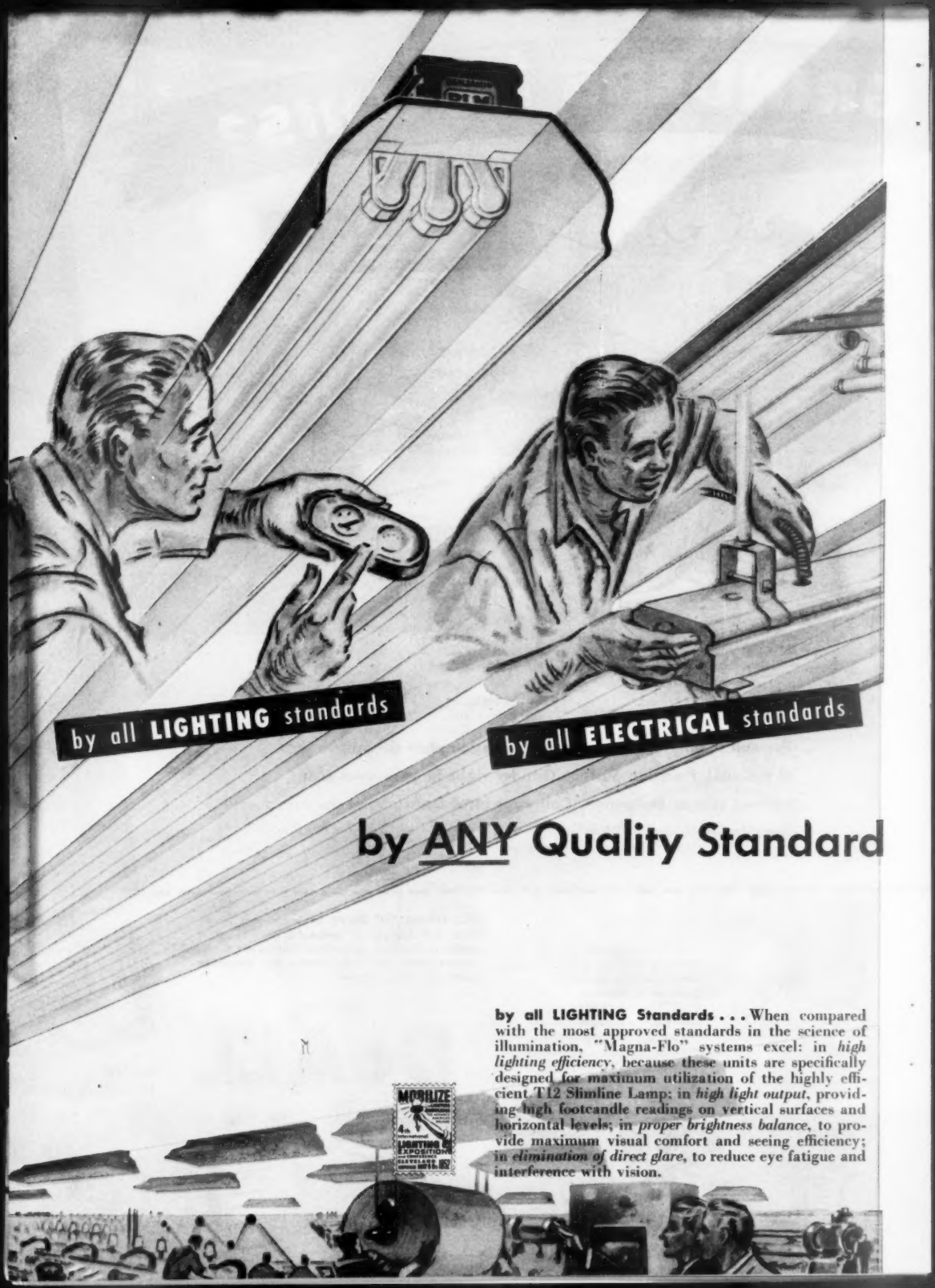
CRUSH GRINDER

GAGING EQUIPMENT

MONOLITE

MOBILE INSPECTION UNITS

TOOL STEEL



by all LIGHTING Standards . . . When compared with the most approved standards in the science of illumination, "Magna-Flo" systems excel: in *high lighting efficiency*, because these units are specifically designed for maximum utilization of the highly efficient T12 Slimline Lamp; in *high light output*, providing high footcandle readings on vertical surfaces and horizontal levels; in *proper brightness balance*, to provide maximum visual comfort and seeing efficiency; in *elimination of direct glare*, to reduce eye fatigue and interference with vision.

BENJAMIN "Magna-Flo" Excels!

Compare Benjamin "Magna-Flo" Industrial Lighting Systems with *all* established quality standards. You'll easily see why "Magna-Flo" units excel *all* ways! The "Magna-Flo" line is SO COMPLETE that over 300 combinations are possible from just 4 basic reflectors and 3 channels. This completeness makes possible TASK-MATCHED installations for the proper lighting of practically all types of industrial seeing tasks. In addition, "Magna-Flo" excels:

by all ELECTRICAL Standards . . . In "Magna-Flo" units you get equipment that meets the maximum established electrical standards to assure simplified installation, high efficiency and dependable operation. Top-of-channel knockouts provide handy line-wire entrances. Channel caps are easily fastened to the channel by two screws. For maximum efficiency and continuously-cool operation only high-power factor "ETL"-approved ballasts are standard equipment on "Magna-Flo" lighting units.

by all CONSTRUCTIONAL Standards . . . You'll find "Magna-Flo" excels in all ways to assure longer life and quicker, simplified maintenance. Reflecting surfaces are genuine "Life-Time" Porcelain Enamel, which does not discolor, scratch or become dull. Year after year, original light-reflecting efficiency can be sustained by simple soap-and-water cleaning. Further, "Magna-Flo" *excels because* ONLY "Magna-Flo" has "Spring-Lox". This all-metal lampholder speeds up re-lamping, improves lighting equipment maintenance.

Write for Bulletin AD-5705, Benjamin Electric Mfg. Co., Dept. N, Des Plaines, Ill.

Acme Steel Strapping Insures S.A. *(Safe Arrival)*

ACME STEEL PRODUCTS DIVISION
ACME STEEL COMPANY
2849 ARCHER AVE., CHICAGO 8, ILL.

An estimated $160,000,000 was lost last year in goods damaged or lost in shipment. Cooperate with the Perfect Shipping Campaign, sponsored by the National Association of Shippers Advisory Boards, to help reduce this loss.

Now LEWIS-SHEPARD®

Offers You ELECTRIC FORK TRUCK Operation at 1/2 the usual cost!

WE TOOK a need and built a truck around it . . . From every indication there was a real *need* for a Rugged, Light-Weight, Electric Fork Truck . . .

- Lower in Price
- Demanding less space than any other
- Calling for slightly less travel and lifting speed

Persistent repeat orders from scores of blue ribbon companies are the very best proof that *the "J" fills the need!*

SPACEMASTER® "J" MODEL from $2765 1000 1500 & 2000 LBS. CAPS. Battery and Charger Included

IF YOU are cramped for space . . . have limited floor load capacity . . . need light duty Electric Fork Truck Operation for

RECEIVING • PRODUCTION • FEEDING
SHIPPING • WAREHOUSING

the "J" will give you all these important time and money saving features . . . *Plus Lewis-Shepard Heavy Fork Truck Quality!*

MULTIPLY MANPOWER · LEWIS-SHEPARD ·

The "MASTER" Line®

SALES-SERVICE in PRINCIPAL CITIES
See Your Yellow Phone Book

Branch Plant
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LEWIS-SHEPARD PRODUCTS, INC.
DEPT. J-6 Watertown 72, Mass.

Please send me complete information about your SPACEMASTER "J" MODEL Electric Fork Truck.

SEND FOR COMPLETE INFORMATION

Name _____

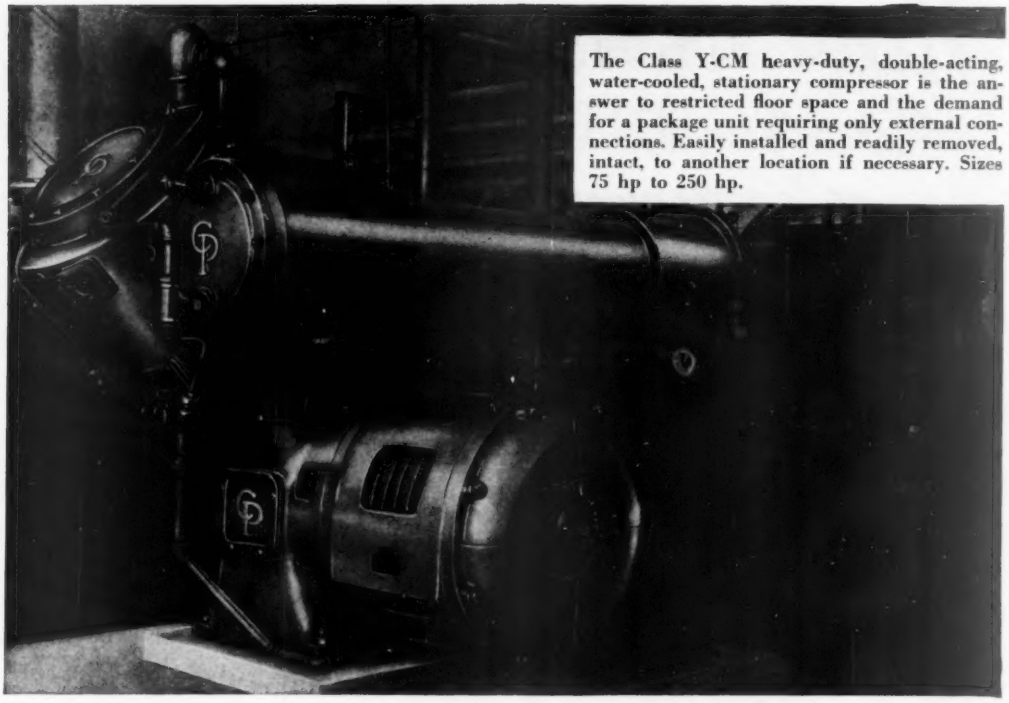
Firm _____

Street _____

City _____ State _____

FORK TRUCKS • ELECTRIC PLATFORM AND PALLET TRUCKS
JACKSTACKERS • TOTEMASTERS • HANDY HOISTERS • STACKERS AND PORTABLE CRANES
HYDRAULIC AND MECHANICAL LIFT TRUCKS • FLOOR TRUCKS • STEELERS • SKIDS • STORAGE RACKS

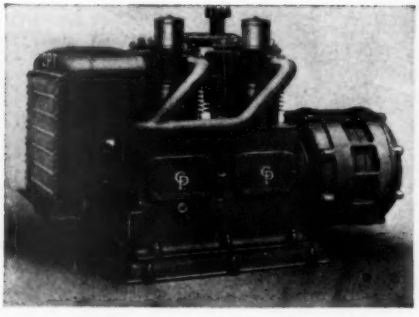
THE MOST COMPLETE LINE IS THE "MASTER" LINE



The Class Y-CM heavy-duty, double-acting, water-cooled, stationary compressor is the answer to restricted floor space and the demand for a package unit requiring only external connections. Easily installed and readily removed, intact, to another location if necessary. Sizes 75 hp to 250 hp.

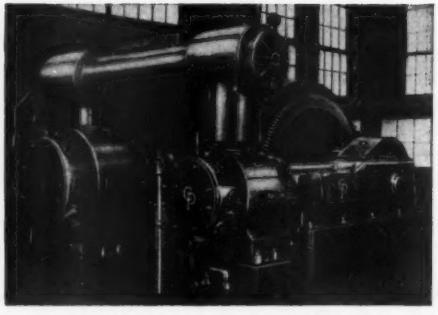
dependable, low maintenance compressors

from 7½ hp to 2000 hp



The small, compact, two-stage Class PM compressor—air-cooled for all-weather operation—may be installed independently of main air system. Also suitable for off-hour operations. Sizes from 25 hp to 100 hp. Available with built-in motor, flexible coupling or V-belt drive.

Write for further information on these and other types of CP Stationary Compressors.

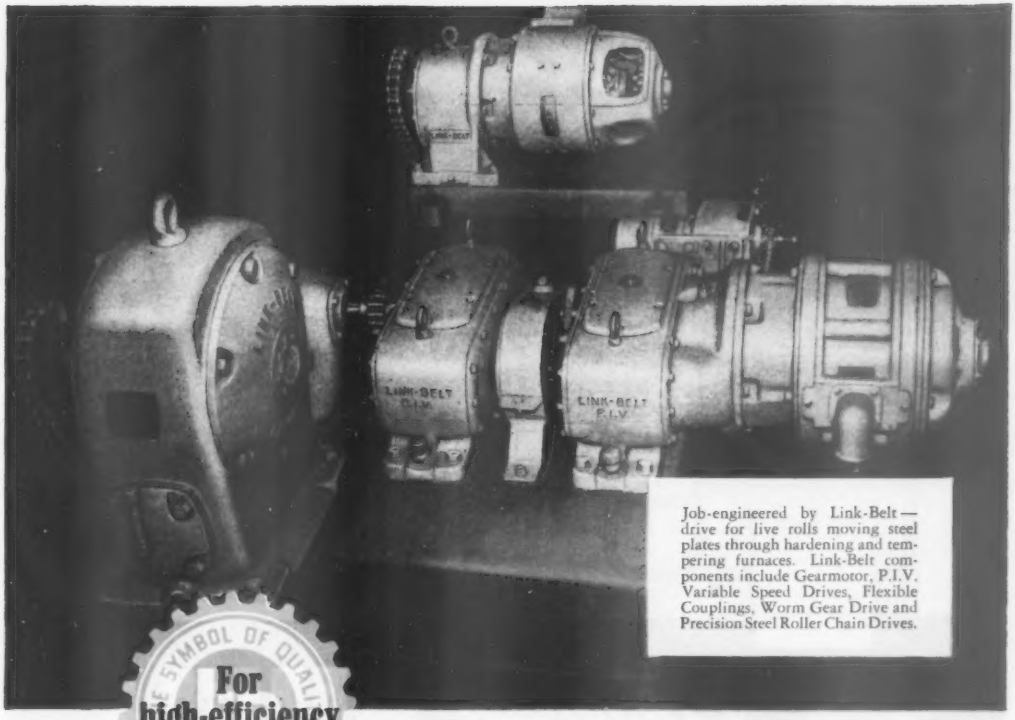


Built in the larger sizes — up to 2000 hp, Class O-CE horizontal duplex motor-driven compressors meet all load demands most economically, and "last forever."

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



Job-engineered by Link-Belt — drive for live rolls moving steel plates through hardening and tempering furnaces. Link-Belt components include Gearmotor, P.I.V. Variable Speed Drives, Flexible Couplings, Worm Gear Drive and Precision Steel Roller Chain Drives.

For high-efficiency production

. . . make LINK-BELT your power transmission headquarters

Extraordinary power transmission requirements call for extraordinary engineering

AT LINK-BELT, power transmission application means far more than a mere fitting together of stock units . . .

- It means careful analysis to determine the exact drives and controls needed for optimum performance under all conditions.
- It means working out all the details for fitting controls and components to the machine.
- It may mean designing special equipment.
- It always means the best possible solution to practical power transmission problems.

Link-Belt builds and applies industry's most complete line of power transmission equipment—chain drives, fluid drives, variable speed drives, helical, herringbone and worm gear drives, bearings, clutches, couplings, etc.

Our vast knowledge of modern industrial requirements is at your disposal. Whatever the need, whatever the speed—call on Link-Belt for power transmission planning.

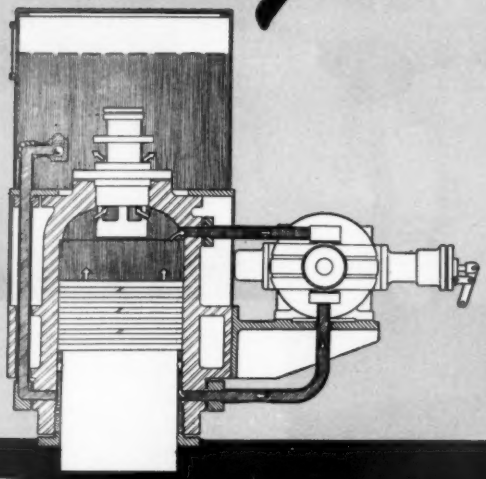
LINK-BELT

12,748

POWER TRANSMISSION EQUIPMENT

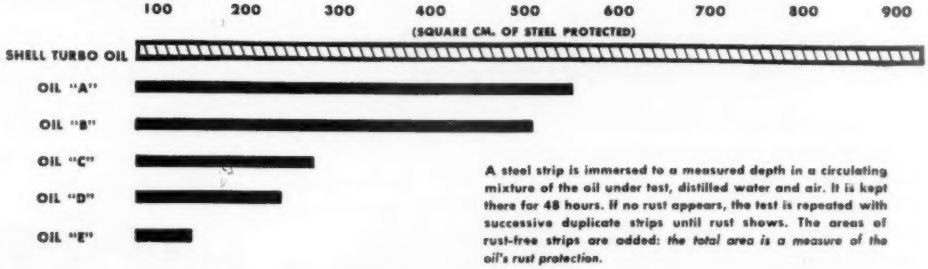
LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities.

Today's surest ...for



Improved SHELL TELLUS OIL

LOOK AT THIS RUST-INHIBITION TEST



A steel strip is immersed to a measured depth in a circulating mixture of the oil under test, distilled water and air. It is kept there for 48 hours. If no rust appears, the test is repeated with successive duplicate strips until rust shows. The areas of rust-free strips are added: *the total area is a measure of the oil's rust protection.*

Improved SHELL TELLUS

protection—
Hydraulic Equipment

The one fluid that:

1. Prevents Rusting

With a new combination of inhibitors, the result of eight years' continuous research and operating tests. The chart on opposite page graphically illustrates the wide margin of superiority with which this new oil protects against rust.

2. Excels in Oxidation Stability

Improved Shell Tellus Oils have even greater resistance to the formation of harmful oxidation products than previously. The specially developed oxidation inhibitor in Improved Shell Tellus Oils enables these oils to far exceed accepted service life. Service records for dozens of hydraulic machines of many types prove outstanding stability with respect to oxidation and sludge formation. You can be confident that sludging will not be a problem in any of the vital parts of your equipment.

3. Reduces Foaming

An effective anti-foam agent provides freedom from foaming caused by the inclusion of air or gases in the hydraulic oil. Thus, a smooth operating system can be realized at all times. Minor air or gas leaks can be tolerated for considerable periods, thus avoiding unscheduled shutdown.

4. Prevents Wear

Because of its outstanding ability to penetrate between closely fitting surfaces, and to maintain a tenacious film at all times, Improved Shell Tellus Oil keeps wear at a minimum. The high film strength persists through variations in pressures and temperatures encountered in hydraulic systems.

5. Has Highest Demulsibility

Improved Shell Tellus Oil provides freedom from emulsions. Experience in service proves a rapid separation from water, even with unusually "wet" systems.

You are invited to write for full information on Improved Shell Tellus Oil. Samples are available for your tests. Write: Shell Oil Company, 50 West 50th Street, New York 20, N. Y. or 100 Bush Street, San Francisco 6, California.

SHELL

OIL *for all Hydraulic Machinery*

LOOK!

for simpler, more accurate temperature control

SYLPHON REGULATOR 999-T WITH DIAL-INDICATING THERMOMETER

WITH THIS Sylphon Regulator 999-T you can control processing operations better. For the dial-indicating thermometer tells you at a glance the temperature being maintained at the regulator bulb location. It eliminates the need for a separate thermometer adjacent to the bulb. And it helps make regulator adjustments easier, better, more accurate.

More advantages! 999-T has a stainless steel frame for minimum heat conduction from valve to regulator head. Its 2-ply Sylphon bellows provides added power. Less height and weight make it more compact. Self-operating—requires no auxiliary power source. Simply and sturdily constructed—ideal as standard equipment.

For added assurance of uniform processing conditions . . . for better performing equipment . . . for prevention of wasteful overheating . . . you can count on 999-T. Ideal for all industrial processing temperature control. Particularly suited for storage water heaters . . . metal plating tanks . . . bottle washers . . . treaters . . . slashers. For complete details, write for Catalog GF.

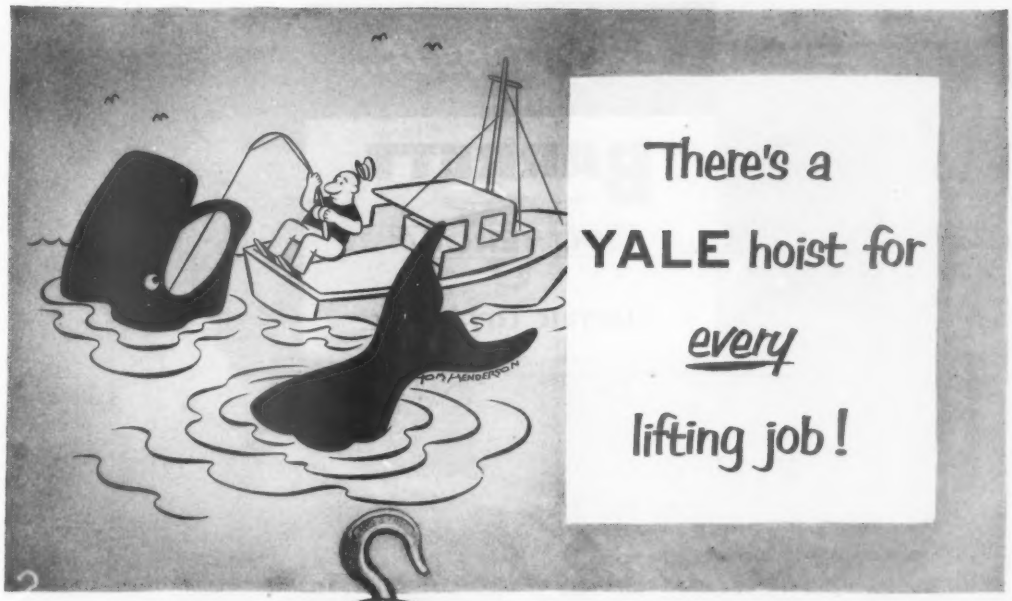
Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON
DIVISION

FIRST WITH BELLOWS

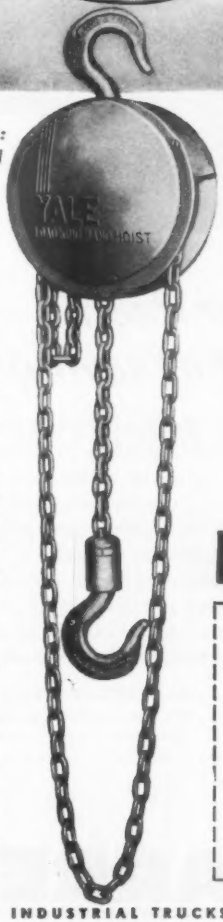
ROBERTSHAW-FULTON CONTROLS CO., KNOXVILLE 4, TENN.

Canadian Representatives, Darling Brothers, Montreal



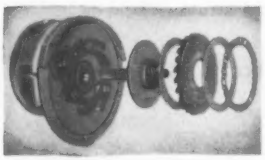
There's a YALE hoist for *every* lifting job!

CAPACITIES:
½, 1, 1½ and 2 tons



THE LOAD KING ALUMINUM HAND HOIST

is light in weight, efficient in performance and truly portable. Half-ton model weighs only 36 lbs. Precision engineering, and ball bearings in *all* rotating shafts minimize friction, raise hoist efficiency *up to 95 per cent*. The Load King's many safety features include SYNCHRO-MATIC Load Brake, Alloy Steel Gears and fractureproof steel Safety Hooks.



Only the YALE Load King

gives you the safe, sure, efficient action of the SYNCHRO-MATIC Load Brake.

If your problem is to save manpower—increase production—speed lifting of any weight from 500 lbs to 40 tons—get in touch with YALE. For YALE has pioneered in the development of safer, more efficient hoisting equipment of every kind. That's why your YALE Distributor can give you such valuable assistance in choosing the *right* hoist for your particular needs. He's listed in your Classified Directory, and ready to help you any time.

The Yale & Towne Manufacturing Co., Phila. 15, Pa.
YALE is a registered Trade Mark of The Yale & Towne Manufacturing Co.

YALE & TOWNE

MAIL THIS COUPON TODAY

The Yale & Towne Manufacturing Co., Dept. 34A
Roosevelt Blvd. & Haldeman Ave., Phila. 15, Pa.

I'm interested in lifting for less with a YALE Hoist.

☐ Please have your local Distributor call on me.
☐ Please send detailed literature on ☐ YALE Hand Hoists. ☐ YALE Electric Hoists.

Company_____

Name_____ Title_____

Street_____ City_____ State_____

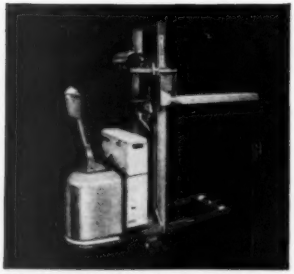
In Canada write: The Yale & Towne Manufacturing Co., St. Catharines, Ont.

YALE GAS AND ELECTRIC INDUSTRIAL TRUCKS • YALE WORKSAVERS • YALE HAND TRUCKS

Easy does it... WITH BARRETT POWEROX ELECTRIC LIFT-TRUCK

PowerOx Model POK for quick handling of skid loads up to 4,000 lbs.

Model PO-POK Platform Truck. Walkie type for handling skids. Short turning radius. 4,000 and 6,000 lb. capacity.



Model PO-40 Hi-Lift Platform Truck. Speeds moving, lifting and stacking of skid platforms and boxes. 4,000 lb. capacity.

Pays for itself out of savings!

Lift and move your heaviest loads with the ease of electric push-button control. Handle any type skids . . . through production . . . around loading zones . . . in and out of storage . . . anywhere in your plant. 270 degree steering for congested area operation. The Barrett PowerOx quickly pays for itself with greater handling speed, low operating cost and easy maintenance features.

4,000 and 6,000 lb. capacities—narrow and wide models—lift, 4″ with 6″, 7″, 9″ and 11″ lowered heights. Variable platform lengths to suit your needs. Models also for handling single and double-faced pallets.

BARRETT-CRAVENS CO.
4629 S. Western Blvd., Chicago 9, Ill.
Representatives in All Principal Cities
Canadian Licensee: S. A. Armstrong, Ltd., Toronto, Canada

GET THIS HELPFUL, ILLUSTRATED CATALOG on the complete Barrett line of materials handling equipment. We'll mail it promptly upon request.

Barrett Handling Equipment

BARRETT

ONE MAN DOES MORE THAN 3 OR 4 . . . WITH A BARRETT

the STETSON is part of the man

JOHN B. STETSON COMPANY
PHILADELPHIA 22, PA.

Mr. C. C. Lucas
Howell Electric Motors
Broad Street Suburban Station
Philadelphia, Penna.

Dear Mr. Lucas:

It is not every day these days that a buyer can express his thanks and appreciation to a vendor for prompt compliance with scheduled delivery dates.

I want to do just that to you and, through you, to the Howell Electric Motors. While I am at it I wish to mention, also, that we are very pleased with the quality of workmanship and cleanness of design of your motors. Because our own product owes its national eminence to quality, we feel peculiarly fitted to recognize that standard in others.

With appreciation for your individual interest and the valuable cooperation of your factory, I remain

Yours very truly,

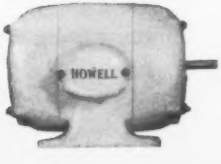
A. Kennedy, Jr.
Plant Engineer

AKjr/mc

MORE PEOPLE WEAR STETSON HATS THAN ANY OTHER BRAND

HOWELL MOTORS are part of the STETSON

HOWELL Type K Motor. Offers constant performance in the presence of dirt, dust, fumes and moisture. Sizes from 3 to 150 H.P. at 1800 R.P.M. Either vertical or horizontal mounting.



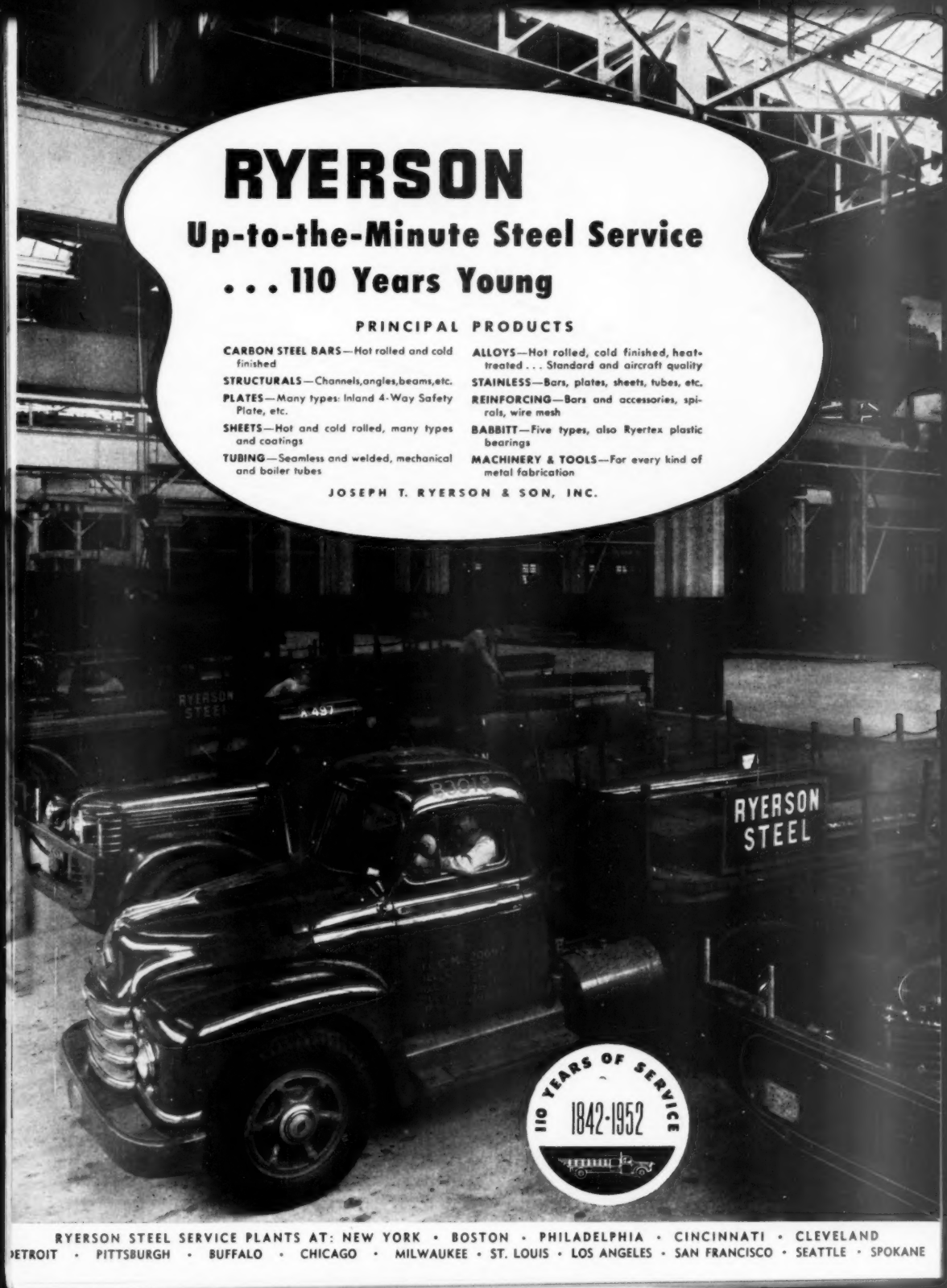
HOWELL Sanitary Motors meet the most exacting standards of the dairy and food industries. They contain no pockets, cracks, or crevices. Available for vertical or horizontal mounting.

We think you, too, will appreciate Howell's attention to your electric motor problems. Howell engineers are always ready with technical assistance on motors in the standard NEMA frame sizes or with specially designed motors if your situation requires them.

So, on the tough jobs, on every job, consult Howell — manufacturers of industrial type motors from 1/6 to 200 H.P. since 1915. Contact the Howell representative in your city or write to us direct.

HOWELL Red Band MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.
Precision-built Industrial Motors Since 1915



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LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

Now you can see why CIO President Philip Murray insisted a year ago that the Wage Stabilization Board handle disputes before the labor members would end their walkout. His foresight is paying off in WSB's recommendations for settling the basic steel dispute.

•

Murray knows how to make good use of government fact-finding panels and boards. Not only does he use them to break industry resistance to key steel union demands, but he opens the door for other unions in other industries to cash in, too.

In 1946 Truman set the 18½-cent first-round wage pattern in steel. In 1949 a steel fact-finding panel paved way for non-contributory pensions. Now WSB gives government backing to union shop.

•

WSB's steel proposals go beyond a simple increase in hour wages. They would spread the union shop and instigate wage practices new to the steel industry and to many other employers.

Eventual cost can't be figured precisely. Concessions won now will be enlarged in years to come. WSB wage raise is 12½ cents now, 15 cents in July, 17½ cents next January, making rate about $2 an hour. Fringes come to 5 cents this year, plus 3½ cents next year. Package totals 26 cents an hour. Steelmakers say it comes to more than 30 cents because of higher pension contributions and payroll taxes that result from higher wages.

•

This is what WSB recommended and possible effect:

• 17½-cent wage increase: In line with what auto, electrical, and other workers got under escalators. May be used to block escalator wage cuts if living costs drop.

• Union shop: Other unions know they, too, can get it from WSB if employer resists. WSB left way open for modified union shop, if Murray agrees. Example: General Motors and Crucible Steel clause exempting present non-union workers. Or "Rand formula" requiring only dues payment.

• Six paid holidays: Pay for holidays not worked is innovation in steel. Unions in other continuous process industries will want it, too.

• Sunday premium: Time and one-quarter will be the rule, beginning next Jan. 1. This is new, too. WSB points out steel companies already pay time and a half for holiday work. (Murray has a foot in the door; next he'll want double time on Sunday, time and a half on Saturday.)

• Third week vacation: After 15 years (instead of 25 years, as now) follows general trend.

• Shift differentials: Increase in second shift premium from 4 to 6 cents, third shift from 6 to 9 cents, follows trend, too.

• Annual wage: WSB suggested joint study leading toward "mutual understanding" next year. This defers showdown, makes wage guarantees next big union target.

•

A "productivity" formula for letting others match the auto workers' 4-cent annual improvement increase is in the making. Signs of it at WSB:

1. Similar increase approved for electrical workers on "inequity" basis.
2. Increase recommended at Wright Aeronautical based on union "concessions" aiding productivity.
3. Higher productivity cited as factor in above-ceiling increase proposed in steel.

•

Cost-of-living escalator wage contracts may not turn out as solid as they seem. Unions will push for changes if living costs continue to fall. Non-operating railroad workers took a 1-cent cut this month. UAW-CIO would like to raise the 5-cent floor under the 24-cent living-cost bonus auto workers are getting.

Shift to new BLS index with postwar base period and lower index figures will require union agreement. Also BLS may use short-cut technique in computing index if Congress cuts funds. These will give unions chance to reconsider escalator clauses. Besides, under WSB policies, workers can get living-cost boosts without the cuts when prices drop.

Paid voting time is constitutional. The Supreme Court said so in upholding Missouri law. That law says a worker must have at least four free hours while polls are open—without loss in pay. About 14 states have laws like this.

SEE PRACTICAL LABOR RELATIONS, PAGE 182

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

Consumer durable goods industries could play an important part in the business outlook for the rest of 1952.

The reason is, consumer durables production may pick up. Metal allocations for the second quarter have been increased—with every prospect of continued easing. So the output of this segment of the economy is expected to start up soon—but it won't reach 1950 levels.

While material shortages will no longer be an important factor in hindering production plans, the real difficulty may be with consumer demand. Should it stick at present levels, production may actually fall below last year's figures.

As the consumer goods industries get enough materials to step up production, chances are lessened for a sharp price inflation. An international crisis later this spring could bring on scare buying. But barring that—or war—no runaway inflation is in sight.

•

Since the easing of the metals supply may be the reason for a possible rise in consumer durables production, a closer look at metals is in order.

By the end of '52 copper will be the only one of the big three metals—aluminum, copper, and steel—still in questionable supply.

Steel output is increasing at a rate that has some steel mill people talking about cutting plans for plant expansion in '53. And nearly 1.4-million tons of aluminum will be available during the year. With a cut in the aircraft program, this may mean that consumer goods industries will get as much aluminum this year as in 1950.

So consumer durables may contribute to a general rise in the index of industrial production which may run from its present 219 level to as high as 225 during '52. Again this assumes no fresh international crisis, no major industrial strikes.

•

All in all the economy may be expected to balance at or somewhere above its present high levels. In that respect it may look pretty much like 1951 when the facts are in. Last year industrial production was steady, and consumer expenditures varied less than 4%.

However stable the total economy was in '51, there were sharp ups and downs for individual elements. Defense expenditures were up nearly 100%. Machine tool shipments were up 100%. But textile production dropped 22%. And auto production fell about 12%.

If these wide swings continue to balance one another, the current high level can be maintained through most of '52. So far, the upswing of defense expenditures and capital investment by industry has kept the downswings in soft goods and consumer durables, which show signs of moving ahead. its base.

•

Stretching out of military production has caused some prophets to fear that some soft spots in the economy will grow softer, and leave the economy with no forward push. It appears now that the 1952 annual rate of defense expenditures will go up only about $15-billion, not $20-billion as originally estimated.

That means an annual rate of defense spending of $58-billion at year's end, instead of about $63-billion. But that's an increase of $40-billion a year since the attack on South Korea — more than Great Britain's entire income in 1951.

Next big crisis may arise toward the end of this year or the beginning of next when the downswing of defense expenditures and capital expenditures by business is scheduled to start.

Big question then will be whether this downswing will be offset by upswings in other parts of the economy—say by recoveries in soft goods and consumer durables, which show signs of moving ahead.

Manufacturers' sales and new orders increased in January. Increasing deliveries of defense items upped shipments of durable goods more than 10% over last January. New orders showed substantial gains. Durable goods industries accounted for nearly three-fourths of this rise.

Manufacturers' inventories and backlogs showed little change between December and January. Manufacturers' inventories, after seasonal adjustment, actually declined for the first time since July, 1950. Stocks of durable goods producers were up less than 1%. This was the smallest dollar gain since the summer of 1950.

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FACTORY
MANAGEMENT AND MAINTENANCE

The Factory of the Future

What is it?

It is a highly automatic plant. It carries us a big step forward on the way we have been moving toward relieving workers of tasks that machines can do better.

Most mechanization so far has been taking the heavy muscle work out of human labor. Today we still use the sensory mechanisms of men and women as control devices. In the future, we'll have more and more machines for this sensory perception. We'll save men and women to make decisions, to do thinking.

Why will it come?

Because it'll make sense—to tough-minded realists.

Studies show clearly that by 1960 our population will shoot up rapidly, but the civilian work force within that population will rise less fast. So, if we want to go on increasing our standard of living, we'll have to make large gains in productivity.

How will *your* company feel the impact of such "national economics"? You'll have a larger market potential for your products. You'll find labor scarce and higher priced. Competition won't let you ignore these facts.

When will it come?

The factory of the future is here today—piecemeal.

It's even here "whole"—in some process industries, for instance.

You may say that it can never come in your plant—that your product units can never be made into anything like a continuous flow. Don't be too sure. Remember that 50 years ago the chemical and oil industries that we think of today as continuous were strictly batch processes turning out barrelfuls.

Industrial evolution is not a smooth progression. Big forward steps come when some individual plant "takes a flyer" into the future. Competition and broad economic forces then dictate how fast others must follow.

So you can't say exactly when the automatic factory of the future will come in your industry—in 1953, or 1960, or 1965. One purpose of this issue of FACTORY is to help you see how fast technological progress is moving now, and how hard the economic forces are tramping on the accelerator.

What will it mean to you personally?

Depends on who you are.

- **If you're an owner-director-top policy maker,** your responsibility is to see that your costs stay at least as low as your competitors' and that your output keeps pace with growth in your market potential. If you fail to do so, your company loses out in competition. You suffer the consequences directly.
- **If you're a plant operating executive,** it's your job to show the owner-directors the technological progress they could make (and to persuade them to make it). If you don't, your own future is imperiled as your company loses out. But if your owner-directors decide to move forward in the early waves of progress, and you personally haven't kept abreast, then you won't go along in a key job.

What does keeping abreast mean to *you*? It means taking the broad principles of progressive technology and management that FACTORY sets forth every month and applying them to detailed thinking about your particular industry. To help you do this, we are trying to show you not just bare trends, but also examples of how they are working out in practice.

Why Today's Factories Can't Meet 1960's Needs

By CARROLL W. BOYCE
National Affairs Editor

IF WE WANT to continue to increase our standard of living at the same rate we increased it from 1940 to 1950...

IF WE WANT to continue to increase our investment in the buildings and equipment that make possible still further increases in the standard of living...

IF WE MUST have a high level of national defense to meet a possible threat of aggression...

THEN—output of goods and services per worker must rise 43% between 1950 and 1960—more than twice as fast as it rose between 1940 and 1950.

This is not a forecast of what *will* happen. It is a statement of what would have to be done to raise living standards at the same rate as in the recent past—at the same time we prepare to meet possible aggression.

All money figures are in "1951 dollars." That is, dollars that will buy a constant amount of goods. The effect of inflation is removed by adjusting actual dollars according to applicable price indexes.

Data for 1940 and 1950 are from the January, 1952, report of the President's Council of Economic Advisers; U. S. Department of Commerce; U. S. Department of Labor.

1 To have a steadily rising a moderately high level of goods and services...

...FOR PERSONAL CONSUMPTION AND RESIDENTIAL HOUSING

Personal consumption of goods and services, plus the houses we live in, determine our standard of living. Consumption includes purchases of such things as autos, washers, etc., even though bought on time. Our per capita purchases of goods and services, plus houses, were 34.3% higher in 1950 than in 1940. Of course, in 1940 we were just coming out of a depression, and in 1950 we were finishing the job of buying durable goods like autos – and houses – that we were denied during the war. So it may be that actual per capita demand won't rise as much during the 1950's. But, if we want to maintain a steady increase in living standards, per capita purchases of goods, services, and housing, would have to be 34.3% higher in 1960 than in 1950. The chart is based on that increase.

...FOR PRIVATE INVESTMENT (buildings, factories, equipment, and inventories)

Private investment provides the facilities to turn out the goods and services that make possible future increases in the standard of living. Because our facilities were run down at the end of a depression, the increase in private investment from 1940 to 1950 was large – 55%. Starting from the relatively high level of 1950, FACTORY is assuming that the same increase as in our immediate living standard, 34.3%, is a good target. Because of the big expansion programs of 1951-52, we may well attain this increase before 1960.

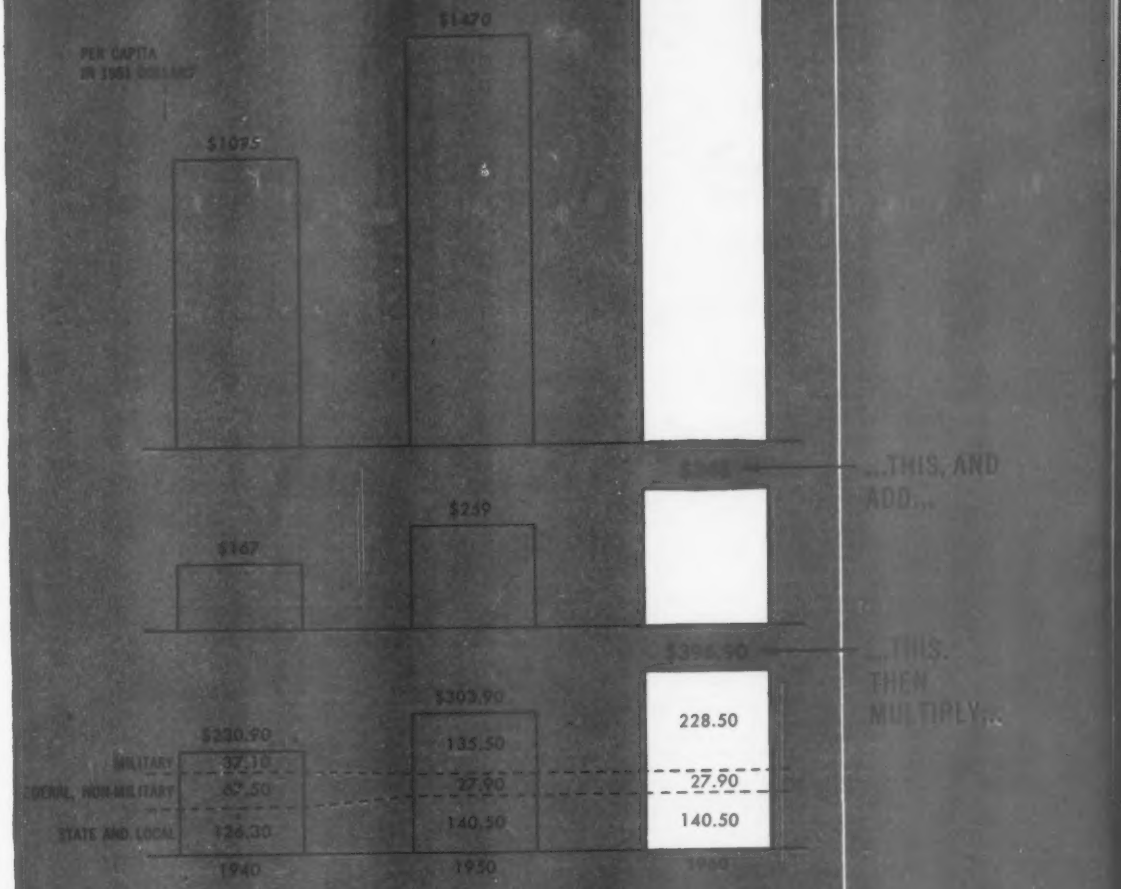
...FOR GOVERNMENT PURCHASES, INCLUDING NATIONAL DEFENSE

Government purchases, except for military, have been expanding very slowly. Federal non-defense purchases of goods and services were actually cut in half from 1940 to 1950. FACTORY assumes non-military purchases will stay at the 1950 level. Military spending is stated to hit a total of $60-billion in 1953, then drop. FACTORY is assuming it will level off at $40-billion, or $228.50 per capita.

2 for this many American people...

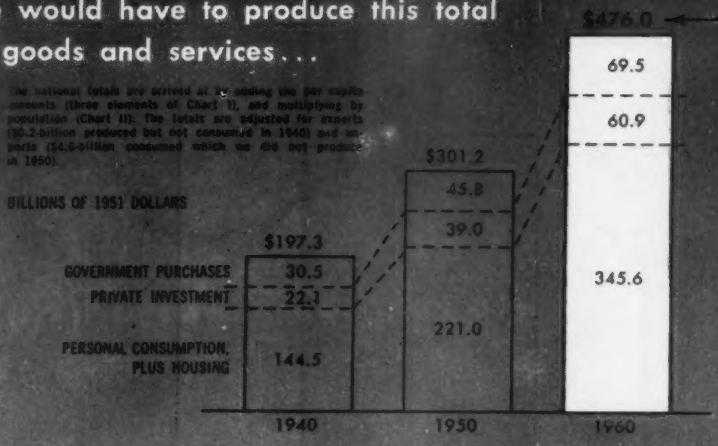
America's population – consumers of goods and services – is increasing at a record rate. The birth rate is high. New medical discoveries are causing the death rate to drop steadily. The Bureau of the Census has just revised upward its estimates of 1960 population. The low estimate by Census for 1960 is 166-million; the high is 182-million. In the past, even high estimates by Census have usually been too conservative. FACTORY is possibly being ultra-conservative in using an average of the Census estimates – 175-million.

standard of living and
national defense, we must have



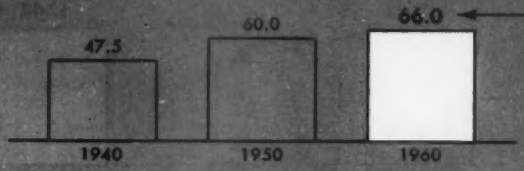
3 we would have to produce this total of goods and services...

The national totals are arrived at by adding the per capita amounts (three elements of Chart II, and multiplying by population (Chart II). The totals are adjusted for exports (30.2-billion produced but not consumed in 1960) and imports (54.6-billion consumed which we did not produce in 1950).



...THIS, DIVIDED BY...

4 with this many civilian workers...



...THIS, RESULTS IN...

Neither unemployed nor members of the Armed Forces are productive in the normal sense; some one else—in civilian employment—must produce the goods and services they consume. (Armed Forces personnel engaged in actual production in the U.S. are an exception to this, but the number of such people is small.)

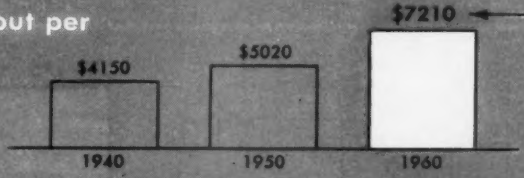
Unemployment in 1940 was 8.1-million; in 1950 it averaged 3.1-million. To give the most favorable net figure FACTORY assumes that in 1960 it will be at a peacetime minimum of 1.5-million. That's the so-called "frictional" unemployment of people constantly changing jobs — not being "put out of work" and unable to find new jobs.

The Armed Forces in 1940 stood at 0.4-million; in 1950 at 1.5-million. Present authorized strength is 3.5-million (actual is a little short of that). FACTORY assumes the figure will stay at 3.5 million. If the cold war ends and the figure drops, we'll have a dividend of more people to produce and fewer non-producers to support.

Total labor force will not increase as rapidly as population between 1950 and 1960. The low birth rate of the 1930's means fewer people coming of working age; young people are staying in school longer; and pension plans are making it possible for more older people to move out of the labor force. Resulting estimates of the 1960 labor force by Bureau of the Census and McGraw-Hill Department of Economics range from 69.5- to 72.5-million. FACTORY has assumed a middle point of 71.0-million, and has subtracted its estimates of unemployed and Armed Services to arrive at its 1960 figure for civilian employment.

5 or this much output per civilian worker

IN 1951 DOLLARS



...THIS

That means an increase in output per worker of 43% between 1950 and 1960 (compared with 21% increase between 1940 and 1950)

In manufacturing . . . the increase in output per worker will have to be *much more than* 43%. The reason is simple: Opportunities for increasing output per worker in the service industries are relatively limited.

Now...could we do this job?

"YES," *says the record of 1949-50-51.*

From 1949 to 1950 output per worker went up 5.1%.

From 1950 to 1951 output per worker went up 6.6%.

And according to surveys by McGraw-Hill's Department of Economics . . .

From 1949 to 1950 manufacturing industries increased physical capacity 5.5%.

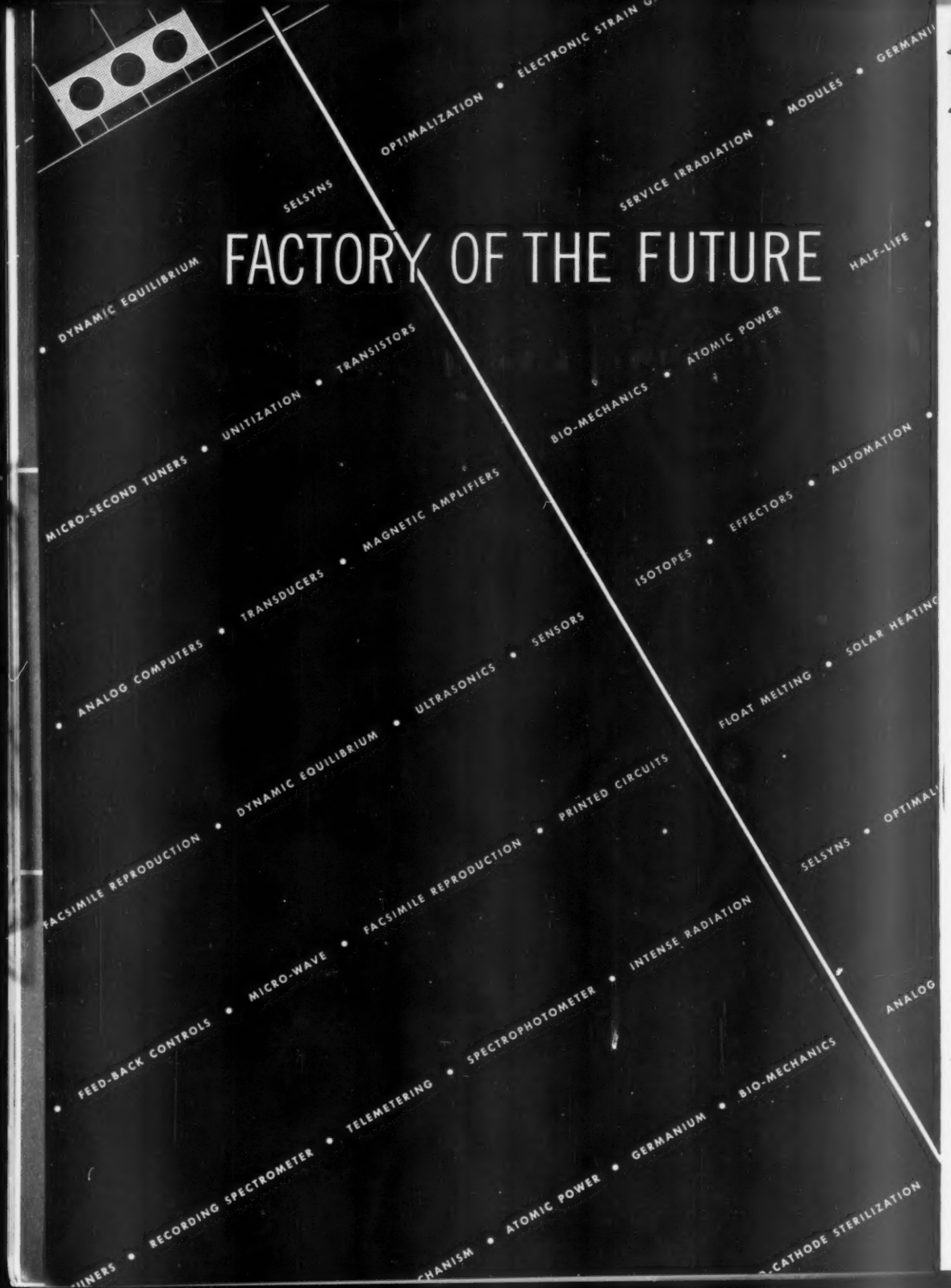
From 1950 to 1951 manufacturing industries increased physical capacity 6.8%.

In 1952 manufacturing industries plan to increase physical capacity 8.5%.

How could we do this job?

There are five ways to increase output per worker. Here's the 1940-1950 record, and how we might increase 43% more by 1960 . . .

1940-1950	1950-1960
BY WORKING LONGER HOURS?	
Probably not. Average weekly hours in manufacturing rose from 38.1 to 40.5, but much of this was offset by increases in holidays, paid vacations, and adoption of portal-to-portal pay. Figures on average work week for non-manufacturing workers are spotty, but seem to indicate a small decline.	The long-term trend is the other way. Shorter work weeks are part of an increasing standard of living. Longer hours are a good way to get a small but quick increase in output during an emergency (as in World War II). But it's certainly not a solution to a "10-year" problem.
BY WORKING FASTER AT PRESENT JOBS?	
In companies that have adopted incentive plans, output per worker has undoubtedly gone up. But, except in the rare cases where arbitrary restrictions have been removed, increases in working speed have made only a small contribution to the total increse in output.	Continued attempts to remove arbitrary restrictions and obtain a reasonable level of effort or speed will help. But, unless the job as well as the speed is improved, the net effect will be small. Prime reason for greater efforts in this direction is to make sure that we get full utilization of machinery and equipment.
BY IMPROVING PERSONAL WORKING EFFICIENCY?	
Methods improvements, mechanized handling, better workplace arrangements, and improvements in the physical and psychological conditions surrounding the job have been the biggest factor in the 1940-1950 increase. Each change has brought only a small increase, but the total has been substantial.	Some of the increase must—and will—come from a continued improvement in personal working efficiency. Certainly we can do more in this area than we did in 1940-1950. Without efforts in this direction we'd probably fall short of the goal. But to rely on these efforts alone would insure failure.
BY NEW TECHNOLOGICAL DEVELOPMENTS?	
Basically new tools, processes, and equipment were responsible for part of the 1940-1950 increase. But major emphasis was always on improvements of existing methods rather than basically new methods. During the war there was little time to think about basic changes; the effect of war-developed technology only began to make itself felt late in the decade.	This is the area with the greatest opportunities for increasing output per worker. The tools, equipment, and processes for a 43% increase are available *today*. Much of this issue is devoted to them. But during the decade even more advanced technology will become available. You'll find in this issue reports on some developments that suggest the possibility of increases several times 43%.
BY BETTER MANAGEMENT AND ORGANIZATION?	
This one is hard to measure. But we certainly know more today than we did in 1940 about selection of employees, placement, training, work scheduling, production control, preventive maintenance, and so forth. These things all add up to better utilization of the men, the methods, and the technology available at any given time. Utilization also contributes a large share to increases in output per worker.	Technological advance will place an even greater burden on management to insure full utilization of both plant and people. Lost time and production will be more costly than ever. In other words, the "penalty for failure"—either human or mechanical—will be greater. In this issue you'll find reports on how managements of the more technologically advanced companies are preparing to meet these problems.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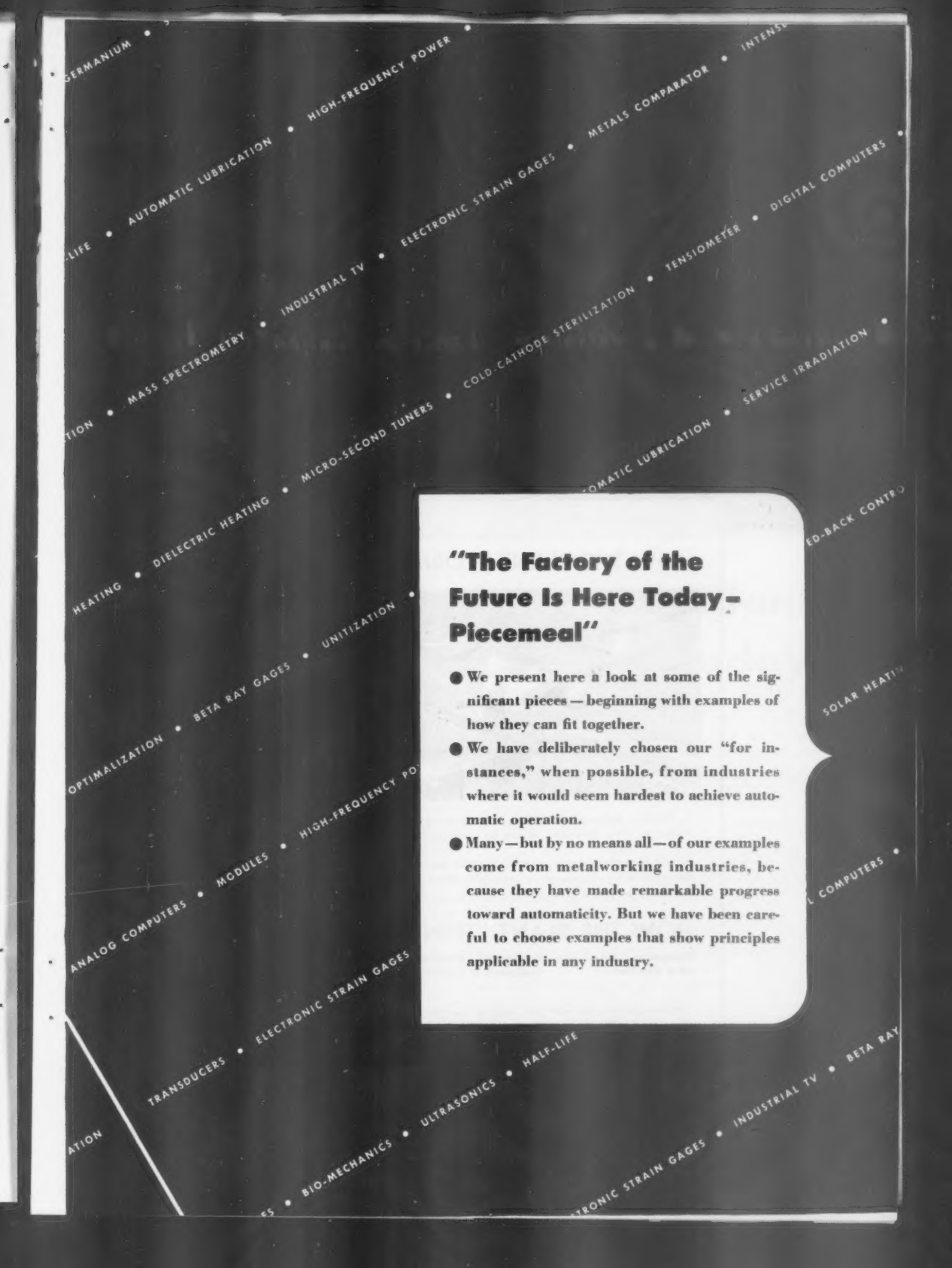
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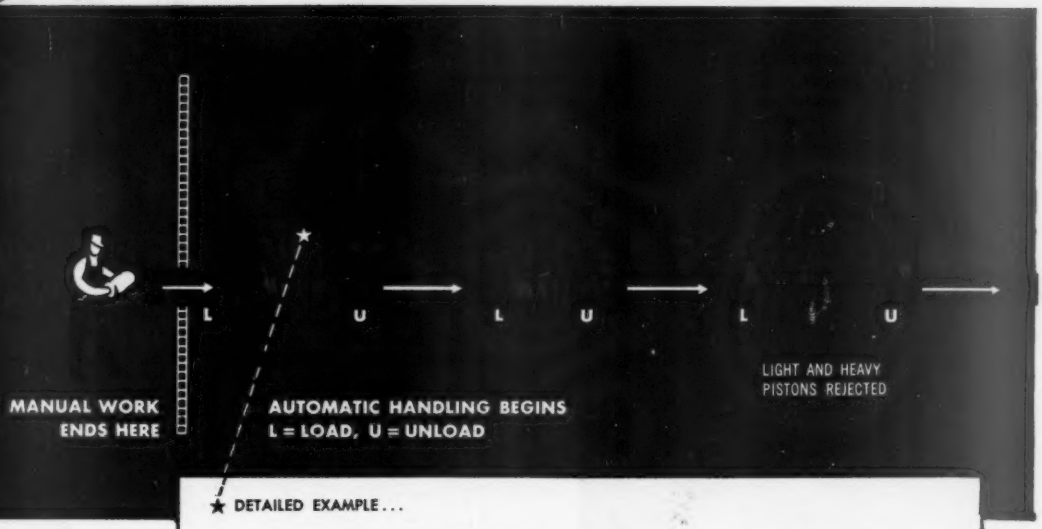
ES • TRONIC STRAIN GAGES

"The Factory of the Future Is Here Today—Piecemeal"

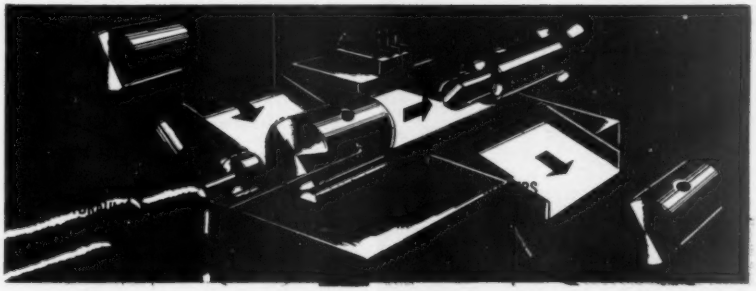
- We present here a look at some of the significant pieces — beginning with examples of how they can fit together.
- We have deliberately chosen our "for instances," when possible, from industries where it would seem hardest to achieve automatic operation.
- Many — but by no means all — of our examples come from metalworking industries, because they have made remarkable progress toward automaticity. But we have been careful to choose examples that show principles applicable in any industry.

"You may say that it can never come in your



★ DETAILED EXAMPLE . . .

HOW THE PLANT WORKS



1. Piston is delivered to locating rollers from a hopper or other automatic release by conveyor.

2. Locating rollers rotate piston until it is in correct position, as determined by retractable locating pin, to be engaged by pusher.

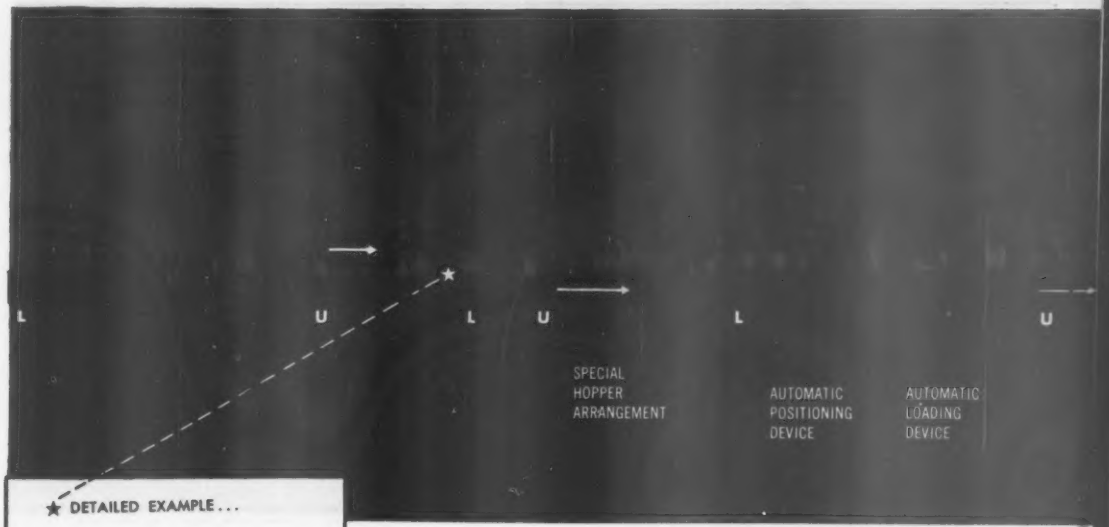
3. When piston is in correct position, retraction of locating pin automatically disengages locating rollers and engages hydraulically operated pusher.

4. Hydraulic pusher moves piston along track, where expanding chuck of machine grasps piston.

HOW THE PLANT "THINKS"

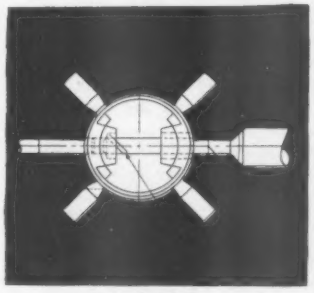
Computer "asks" sensory devices:	Additional questions and action indicated if answers are negative.
"Did first station index with piston on chuck?"	Belt stopped automatically — castings not fed to belt from hopper. Check power on Machine No. 1. If negative continuously, automatically shift to standby line. Notify maintenance.
"Did piston unload at sixth station?"	Same as above. All partially machined parts returned to hopper, which then feeds standby machines.

plant. Don't be too sure."



★ DETAILED EXAMPLE...

OPERATION NO. 60



FINISH-BORE WRIST-PIN HOLE

Explanation of operations:

1. Piston is automatically delivered and placed in single-end boring machine (see flow diagram).
2. Piston is rotated and located by retracting pin.
3. Piston is automatically clamped in chuck.
4. Boring tool is then fed in from right to left automatically. Wrist pin hole is finish-bored to 0.9122-0.9125 automatically.
5. Piston is automatically unloaded onto conveyor.

This Automatic Plant Could Be Built Today

YOU COULD GO OUT THIS AFTERNOON and place orders for the machines, equipment, and control devices necessary for the plant diagrammed above—to make automotive pistons without a single operator. Of course, you'd still need a maintenance crew.

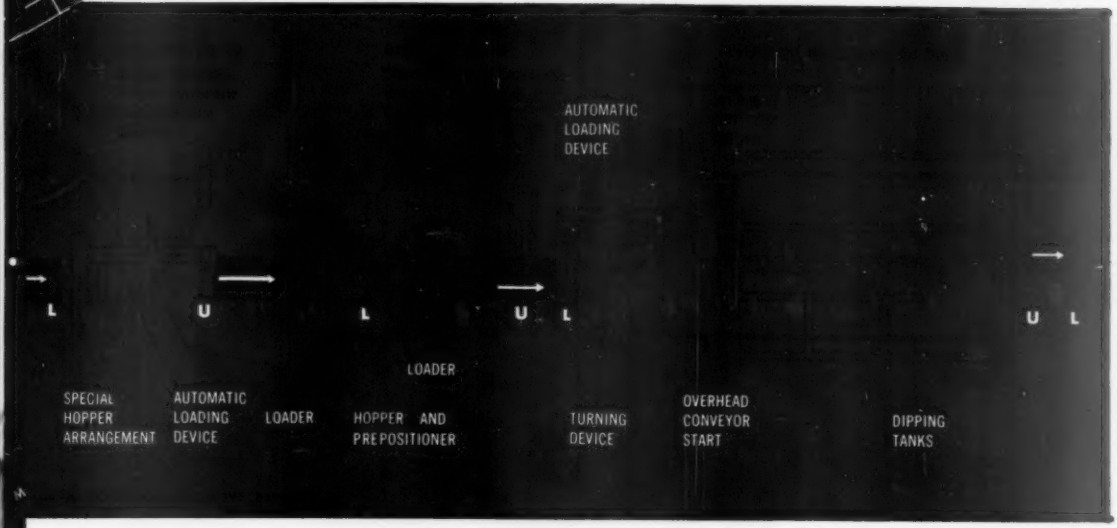
You'd also need a big pile of money—and the ability to convince people you were serious.

But the basic machines—and the technological know-how to modify them—are on the market.

That's the conclusion of a report titled, *Making the Automatic Factory a Reality.* It was prepared by engineers in the manufacturing course at the Harvard Business School.

Part of the report is a blueprint for an automatic piston factory. It contains not only the schematic layout shown on these and the next two pages, but also detailed diagrams of the automatic loading and unloading devices that would be needed. There's also a "schedule" of operating decisions to be made by the digital computer ("electronic brain") that controls the entire production line.

This automatic piston factory is not necessarily the "factory of the future." But it indicates a type of thinking that will be needed to build the factory of the future. Turn the page to see how



This automatic plant will help you plan your factory of the future . . .

"The true factory of the future won't be built until people start thinking in terms of whole processes, and in terms of the functions of products rather than the specific products now being made."

That's the substance of the conclusions of the Harvard group that wrote the report on *Making the Automatic Factory a Reality*. It's also what we were told time and again by the men in industry who are doing the really forward thinking about factories of the future.

Here's what the Harvard group said:

"A great gap must be closed before automatic production can in any significant sense become a reality. That gap is primarily informational. Most manufacturers do not know what is technologically possible in the way of automatic production. Nor do they realize in what terms they must think in order to usefully apply this technology . . . .

"So long as one's thinking is not confined to duplicating motions presently performed by the human hand, and so long as one can think of what a possible variation in product design or process could accomplish, there is every reason to believe that much more could be done automatically . . . .

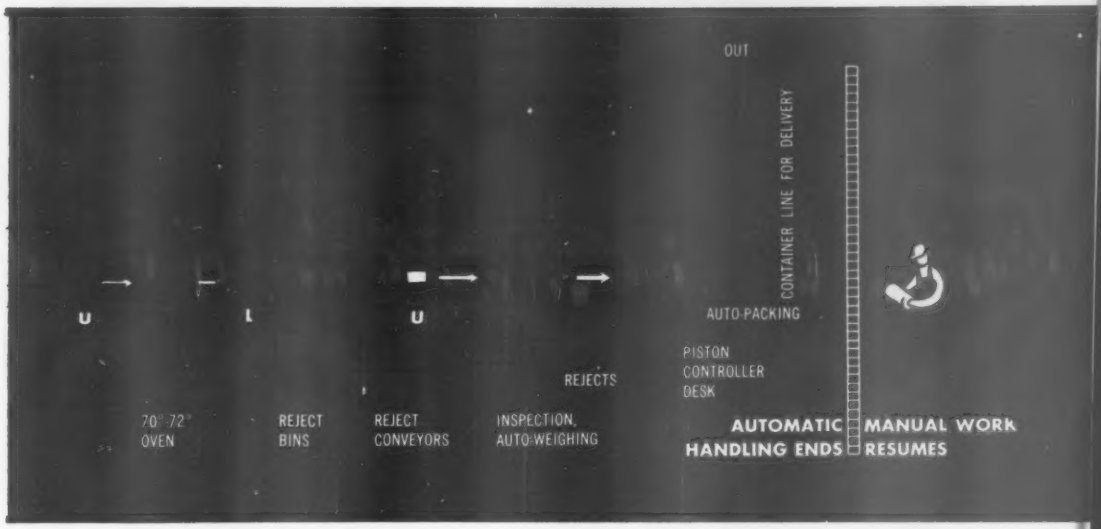
"It is difficult to describe what such basic 'rethinking' consists of. It starts with the ability to look at the functions performed by an end-product and to ask the question, 'Can some other product, made by a process more suited to automatic control, perform the functions which the user now expects of this product?' . . .

"Look at the desired product and say, 'How could this product be made?' The process by which one knows that object is made will be the first answer to come to mind. But if it is possible to continue thinking in terms of 'How could this object be made?' one is not tied to the original process, and the possibility of developing a process economically suitable to automatic control is greatly increased."

The authors of the Harvard report have not gone as far as they might have in terms of "rethinking." The result, of course, is to give greater credibility to the proposal they make.

But they have called for a change in product design. Two locating holes must be cast into the rough piston to permit automatic locating of the product in the machines. (On the opposite page is an example of more radical product redesign to permit automatic production.)

The Harvard engineers have introduced a significant change in thinking about mass production methods. They propose continuous production on flexible instead of special-purpose machines. "General-purpose" would be too broad a term. But if the market for pistons collapsed, this "piston factory" could start turning out bearing rings for gas



turbines. The conversion would not be automatic, but it would not be too difficult.

What if the piston line breaks down? The controlling computer can "shunt" work to parallel lines, readjust the balance of the whole plant to maintain maximum operations during repairs.

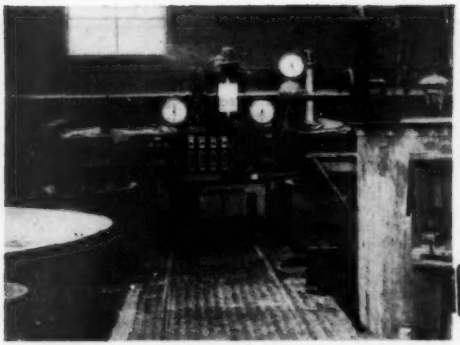
Redesigning a Product Toward Automatic Production

Once a chair is thought of primarily as a device for supporting a sitter 16 inches, say, above the floor, it's easy to redesign.

HAND • Wood slab and sticks shaped by hand tools and hand assembled. *Designer:* unknown.

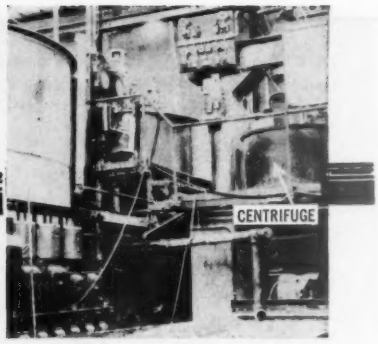
MACHINE • Wood sliced into laminations, capable of machine forming and electronic gluing, but requiring some hand finish and hand assembly. *Designer:* Charles Eames.

AUTOMATIC FACTORY • Wood ground into chips, conveyed in water, gathered on shaped screen—emerging from mold with integral color and perfect surface. (Continuous process envisioned resembles that used in making such a hardboard as "Masonite," except that the hardboard is gathered on a flat screen.) *Designers:* Robert E. Lewis, James L. Prestini, and Armour Research Foundation.



1 **MIXING** oleic and coconut fatty acids—primary ingredients of napalm—is next thing to automatic. Acids are pumped to mixing tanks above from 15,000-gal. storage tanks. Tanks are housed in a 95-deg. room. Same pumps also unload acids from railroad tank cars. Control panel regulates flow of all ingredients. There's a duplicate set of controls in the "hot" room below.

A manually started, electric solenoid valve controls acid flow and prevents human errors. Preset flow meters control amount of acid pumped. The only non-automatic handling here is the dumping of caustic soda and alum. Electric tilt hoists do the real work.



2 **CENTRIFUGING** follows mixing. The napalm mixture is pumped to centrifuges and water is extracted until the napalm drops to bottom of centrifuge and onto a vibrating feeder. Feeder carries it to a bucket elevator which, in turn, lifts it to a storage bin (upper right). There, high- and low-level sensory units keep the napalm level right.

Panelboard (upper center) makes it easy to control centrifuging operation. From centrifuge, napalm flows to a horizontal rotary dryer.

This 99% Automatic Plant Is

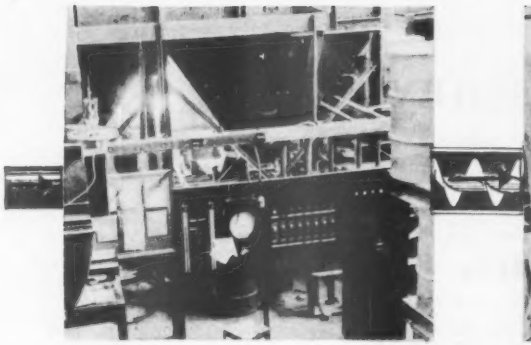
- **This 100x100-ft. plant can turn out 650,000 pounds of napalm a month.**
- **It runs round-the-clock—with only four operators and one supervisor per shift.**
- **This new process for making napalm continuously has cut product cost by 59%.**

NOBODY HAS EVER BUILT a completely automatic plant. Not yet. But it could be built (see page 74). And some day somebody will build it.

Right now, the closest thing to it may be Ferro Chemical Corporation's napalm plant in Bedford, Ohio. It misses 100% automaticity by a hair.

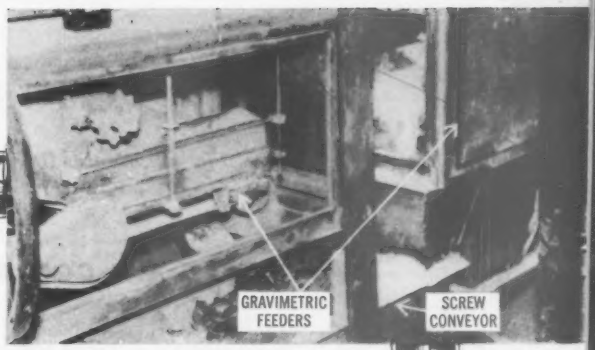
Napalm, you will recall, is the jellied gasoline used in incendiary bombs. The new Ferro plant can turn out 650,000 pounds of napalm a month with a crew of four operators and one supervisor per shift. The plant works round-the-clock. And the continuous napalm-making process developed by Ferro—a new one for the industry—cuts product cost 59%.

The 5-man operating crew floats between machines, watching first this process, then that. Most of the equipment



3 **DRYING** temperature is controlled by a regulator (arrow) that pneumatically actuates a diaphragm-lever valve. Valve, in turn, operates a damper to control amount of warm air flowing to dryer. Panel at right of regulator controls proportioning equipment that mixes napalm with silica aerogel.

This board, one of eight, contains push-buttons and signal lights that tell the condition of plant equipment. Sequentially interlocked relay system shuts down entire system should a breakdown occur at any point. From dryer, napalm moves by screw conveyor to proportioning equipment.



4 **PROPORTIONING** equipment is composed of two electrically controlled gravimetric feeders. One meters napalm; the other, silica aerogel.

The two materials pass through feeders and drop into a 35-ft. blending screw conveyor that carries them to the mill room where they are elevated by conveyor to a storage hopper.

High- and low-level sensory units in bin again tell operator how much napalm is in storage.

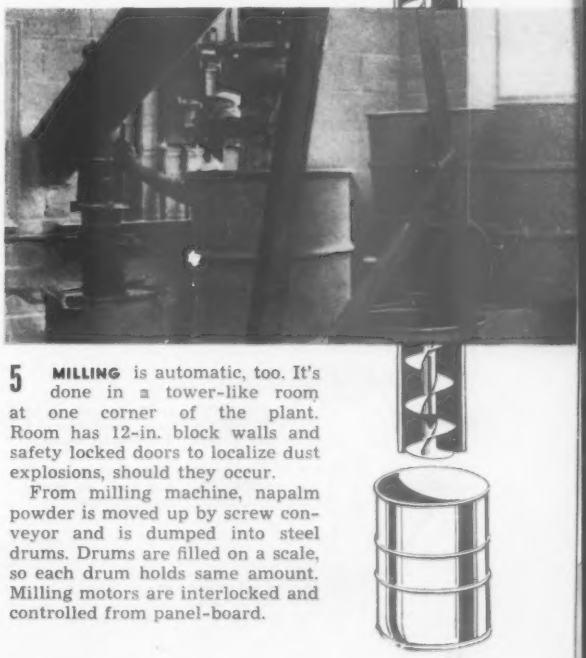
Running Today

is monitored automatically by electric watchdogs. Signals light and bells ring if the continuous process breaks down at any point. Sequential interlocking of motors and conveyors prevents damage or tie-ups.

Despite the near-100% automatic operation, all equipment in the plant is standard. It has simply been adapted to line-type mass production.

Just any standard equipment might not work. Equipment selected had to be adaptable to electric or automatic control.

Ferro has just one maintenance mechanic for this particular plant. But he can keep it going. Biggest maintenance problem may be instrument upkeep. Ferro says the best way to get instruments repaired is to send them back to the maker —or to maker's approved repair center.



5 **MILLING** is automatic, too. It's done in a tower-like room at one corner of the plant. Room has 12-in. block walls and safety locked doors to localize dust explosions, should they occur.

From milling machine, napalm powder is moved up by screw conveyor and is dumped into steel drums. Drums are filled on a scale, so each drum holds same amount. Milling motors are interlocked and controlled from panel-board.

Glossary

You'll be talking this lingo in the factory of the future

BASIC TERMS AND CONCEPTS

Automation • This started out as a coined word at the Ford Motor Company. There, it is still used in its original meaning: Automatic handling of materials and parts in and out of machines. Popular usage has broadened the term to include almost anything in the way of automatic handling, processing, or machining.

Bio-mechanics • This is the science of matching the work situation (tools, equipment, and environment) to the worker's mental and physical ability and requirements. It covers almost anything from a matter as simple as how far can a man reach easily to the effect of noise levels on how fast he can react in an emergency.

Discrete units • Any separate, identifiable unit of production. Discrete unit is the "opposite number" of the homogeneous flow of material associated with the so-called continuous process industries. The true automatic factory involves continuous processing of discrete units as well as homogeneous material. The piston factory on page 74, or the continuous casting of steel or brass, are examples of continuous processing of discrete units.

Dynamic equilibrium • The condition of over-all balance required for smooth, trouble-free operation of a continuous process. In wire drawing, for example, the rollers for successive draws must turn at different rates of speed. But the relative speed of the rollers must be correct if the wire is not to back up or break. When the relative speeds are correct, the process is in dynamic equilibrium.

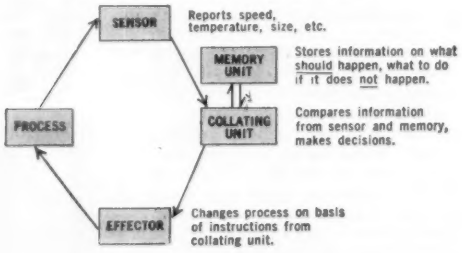
End-point control • Once a process is in a condition of dynamic equilibrium, it is possible to control the entire process by simply monitoring the end point. If a change takes place in the quantity or quality of product at the end point, a computer can determine what changes must be made at intermediate (in-process) points to restore the end-point to its desired condition. With true end-point control, the changes at intermediate points are made automatically by the devices attached to the computer.

High-frequency power • As yet, there

THESE CONCEPTS OF CONTROL ARE FUNDAMENTAL

ANY CONTROL SYSTEM has four elements:

1. **A sensor,** which checks the process. It reports what *is* happening in terms of speed, pressure, size, weight, or any other *measurable* process variable.
2. **A memory,** which is a master record. It knows what *should* be happening, and what to do if it is *not* happening.
3. **A collator,** which compares information from the sensor with information from the memory. In case of any differences, it "calls up" from the memory instructions on what to do.
4. **An effector,** which changes the process on the basis of instructions relayed by the collator.


SENSOR
Reports speed, temperature, size, etc.
MEMORY UNIT
Stores information on what should happen, what to do if it does not happen.
PROCESS
COLLATING UNIT
Compares information from sensor and memory, makes decisions.
EFFECTOR
Changes process on basis of instructions from collating unit.

A single human being, without the aid of so much as paper and pencil, can be a complete "process control system." Of course, the results are crude.

Instruments and records improve the *precision* of the control system.

AUTOMATIC CONTROL comes only when you build a complete and integrated electrical or mechanical counterpart of the four basic control elements.

A SERVO-SYSTEM is both the brain and muscle of any automatic control. Broadly, any automatic self-regulating device is a servo-system.

Here's how the elements of a servo-system perform the basic functions of control:

1. Command station (memory). Either a man or a computer can set the controls at the command station to correspond to what *should* be happening to the process. This information is translated into a command signal and sent to . . .

. . . 2. An error measuring device (sensor plus collator). The sensor produces a signal—called output feedback—which corresponds to what *is* happening to the process. The collator compares this with the command signal. The difference, if any, is called an error signal and is sent to . . .

. . . 3. An amplifier-controller (part of the effector).

is no generally accepted definition of high-frequency, as the term is applied to power transmission. Since most power is transmitted at 60 cycles per second, some engineers refer to anything above 60 cps. as high frequency. New industrial applications for power require sources up to 400 and occasionally 1000 cps. In most cases, people will be talking about that range when they refer to high-frequency power. (As applied to radio, high frequency means 3-million to 30-million cps.)

Integrated handling • When the same system that moves parts or materials from one operation to the next also loads and unloads the machines, you have integrated handling. There's no basic difference between integrated handling and Ford's original definition of automation.

Miniaturization • This is the process of designing and producing a miniature that will perform the same functions as the larger sized original. Miniaturization got its big boost from the need for conserving weight and size in airborne equipment. The trend has continued as a means of saving materials and cutting production costs.

Modularization • Designing or producing parts or components on a basic module. The basic module is the standard dimension of the smallest part or component; all others are multiples of this basic module. For example, you might take three feet as the basic module for interior partitions. You'd produce all your panels to measurements of multiples of three feet —3'x6', 9'x12', etc. As long as the full measurement of the petition you want is divisible by three, you can make up the partition from standard panels.

Optimalization • You can't have everything about a process absolutely perfect. Either human or engineering limitations get in the way. Optimalization is the process of arriving at the best or most favorable combination of compromises by analytical methods, rather than by-guess-and-by-gosh.

Telemetering • You're telemetering when you transmit metered or instrument-obtained information from the point of action to some central observation point. It's not a necessary part of the definition, but usually process control is also exercised from the central point (reverse telemetering).

Ultrasonics • This is a new term to describe the range of vibration frequencies above the audible range (roughly 10,000 cps. and up). The upper limit of ultrasonic frequencies is not clear. The Federal Communications Commission defines radio frequencies as anything above 0.1 megacycles, yet "ultrasonic" equipment now on the market operates up to 1.0 megacycles.

Vibrations in the ultrasonic range cause some unusual—and useful—phenomena.

Particles of some materials are broken up by ultrasonic vibrations. That makes it possible to mix normally immiscible liquids, and to degrease metal parts. An ultrasonic soldering iron will break up particles of aluminum oxide so fast that it is possible to solder aluminum with ordinary soft solder. Particles of dirt or contaminant can be flaked off a surface, to speed and improve the quality of cleaning.

On the other hand, ultrasonic vibrations can cause a colloidal solution to precipitate. One possible application is the precipitation of smoke and fumes in chimneys.

The manner in which ultrasonic vibrations spread through a solid provides a means of testing for internal holes or flaws.

Unitization • Controls, particularly, are being unitized these days. That is, the control is not only assembled of standard parts but of standard units. One big advantage is that when repair is required, the faulty unit can be pulled out and replaced with a good one. Repairs can be made in the shop, where tools and manpower are available, rather than under production-line pressure. Or the unit can be sent back to the maker.

You'll sometimes hear these units referred to as "building blocks," or (especially in the case of electronic controls) as "brain blocks." There are some cases in which a unit can not only be replaced by a duplicate but by a different unit (on the same module, and with connections located in the same positions). The result in such cases is to change the nature of the control, by simply using a new combination of standard, interchangeable units.

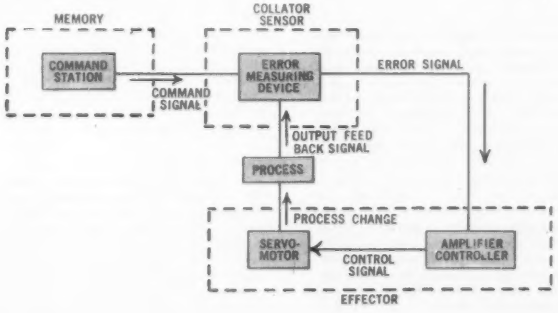
Some manufacturers are thinking in terms of industry-wide standardization of "building blocks," so that a minimum of special components, plus a combination of blocks from a total of not more than a couple of hundred, will make it possible to build any desired control. This would overcome the present objection to "building blocks": A big inventory investment in spare parts.

Here the error signal is amplified until it is potent enough to control . . .

. . . **4. A servo-motor** (also part of the effector). In response to the control signal, the servo-motor actually makes the changes in the process. This is the source of the "output feedback" signal.

Actually, the term servo-motor is a bad one. A servo-motor need not be a motor at all. It is any device that will control the desired process variable—quantity, pressure, temperature, size, etc.

Depending on the nature of the process to which a servo-system is attached, the signals may be mechanical (or hydraulic or pneumatic), rather than electrical. In that case, "purists" refer to the system as a servo-mechanism. Most people use the two terms interchangeably.



COMPUTERS

Analog computer • This is one of the two basic types of electronic brains. The analog computer is an electronic system with various elements which behave in the same way as the elements of the physical system to which it is similar or analogous. In other words, the analog computer is an electronic reproduction of the system it is analyzing.

The analog computer is not an absolutely precise instrument. It

thinks in physical terms, delivers "answers" in physical rather than numerical terms. The numerical result is what's called an "engineering approximation."

Big use for the analog computer in industry seems to be as a control device attached to a process. By attaching both control and recording (feed-back) circuits to corresponding elements of the physical system, you can guarantee that the system remains in a state of dynamic equilibrium, even while starting up or shutting down.

Here's how it works: The electronic system in the computer, by its design, must remain in balance. But it can readjust to new conditions almost instantly; the physical system cannot. The feedback prevents the computer from changing too rapidly for the physical system, keeps everything in balance during a change.

The series of rollers in a steel reduction mill illustrate the point. If you increase the pressure on the second set of rollers in a series of three (but don't change the first and third sets), sheet will be rolling out of #1 faster than #2 can handle it; #2 won't be putting out material fast enough to supply #3. The result is a mess, and a dangerous one. An analog computer attached to the series of rollers prevents this by maintaining the dynamic equilibrium of the system at all times.

Digital computer. This is the second basic type of electronic brain. Like a desk calculating machine, it deals only in numbers—but it has a memory. That is, it can "remember" the result of one calculation, use that result later as part of another calculation. No need for a human being to write down the intermediate results, later feed them back into the machine when needed. The other big advantage: The digital computer is lightning fast. Even the very slow ones do in a sixteenth of a second calculations that would take 20 seconds with a desk calculator.

But the speed also presents some problems: Unless you have a big engineering staff to do problems for, most companies couldn't keep a computer busy. One very big company feeds data on bills of materials and products shipped into a computer. In less than four hours, the computer has produced a complete statement of month-end inventory position on every part and material. The company considers this a spare time job for the computer; its main job is solving engineering problems.

The digital computer gives precise answers in numbers. But you have to "program" all the calculations. That is, you have to rig the computer (in some types, insert "program" cards) to perform the sequence of additions necessary to get the answers. Every operation (subtraction, multiplication, division) has to be reduced to a problem in addition.

The digital computer can also be used as a control device. It can "check" the answer to a calculation against its memory. If the answer falls outside of the figures you have placed in the memory, it will actuate a control to make the necessary correction in the process. However, only "yes" or "no" decisions are possible. If you want to select among several alternatives, you have to "program" a series of yes or no questions that will get you to the final answer.

Another use for small-size digital computers is starting and stopping heavy machinery. You would first use an analog computer to determine the sequence of control to be applied to maintain dynamic equilibrium during the start and stop. Then you attach the digital computer to the process. This insures that the process will not get "out of control" during stop and start (times when the greatest damage is done). It's also possible to rig even the simplest computer to shut the process down automatically in case of trouble.

ELECTRONICS AND CONTROLS

Selsyn • The word selsyn is formed by abbreviating the term "self-synchronizing." It has become widely used to describe any combination of remotely located, electrically connected machines, all of which follow the exact angular position of the "master." That is, the rotors of the synchronous motors associated with each machine will automatically be in the same position at any given time. Where actual motors are used in a servo-system, they are generally of the selsyn type, with the output of the amplifier-controller operating the "master" selsyn. The "captive" selsyns are the effectors.

Germanium rectifier • You can rectify alternating current (change it to direct current) by passing it through a tiny crystal of germanium. Germanium is one of the so-called "rare earths." It was discovered about 75 years ago; only recently have its rectifying properties been known. It's still expensive (and because of military applications hard to get at any price), but has these advantages: Small, light, very long life, practically unbreakable, and highly efficient. The efficiency comes from the fact that it does not dissipate power in the form of heat.

Major drawback: Up to the present time, it has been proved only for small-power applications. But the whole field is so new there is no widely accepted theory even to indicate whether heavy power applications are possible.

Junction transistor • When you make a sandwich out of three pieces of germanium (type-*n*, type-*p*, type-*n*), and attach wires to each, you have a junction transistor. It can be used as an amplifier in much the same way as a three-element (triode) electron tube. Small changes in the potential applied to the type *p* germanium (corresponding to the grid in a tube) produce big changes in the power output of the transistor. A pair of junction transistors coupled to make a two-stage amplifier (amplification up to 10,000 times) occupy less space than a "miniature" electron tube.

Transistors don't heat up, so efficiency is near 100%. On the other hand, heat from nearby electron tubes reduces their efficiency (and in some cases changes their operating characteristics).

Transistors are rugged and have a long life (no one has been able to cause any "wear" on one since they were first "discovered" about four years ago).

Most production is now going to the armed forces, and they're expensive. But some engineers believe the transistor will soon replace 90% of electron tubes in industrial equipment, where assurance of trouble-free service and small size is worth the higher price.

Magnetic amplifier • Amplifying electric current is really just controlling the output of high-power source by variations of a low-power source. In the case of a magnetic amplifier, high-power source is a-c winding around a "saturable core." Low-power source is small d-c winding. A small change in the d-c input causes a big change in a-c output. Its principal application to date is for controlling adjustable speed drives.

Magetic amplifiers require no warm-up period, are rugged in construction, yet are small enough to be located inside most control panels. There are no moving parts to wear or require service.

Drawbacks: Limited power load (but sufficient for most control applications); limited frequency response (for most designs, 400 cycles per second—but some will handle 1000 cps.).

Magnetic record playback control • You can attach electronic recording devices to the moving parts of any machine tool. As a "master part" is machined by hand, the output of the electronic instruments is recorded on magnetic tape. Then you hook up the system in reverse, so that "playing" the tape operates control devices

on the machine tool. The result is to produce perfect duplicates of the master part.

Tape control • You can put control devices on machine tool that will respond to electronic signals. One way to get those signals is to punch holes in a piece of tape—with the holes corresponding to the dimensions of the part you want to machine. When you run the tape over an electronic "sensing" device, the machine tool operates in such a way as to produce the exact part "described" by the holes in the tape. With a tape control on a lathe, for example, you can cut tapers and radii.

Printed circuit • The term "printed circuit" is used loosely to describe any complete wiring circuit produced in a single operation, rather than by joining individual wires. It consists of conductive material deposited in a pattern on some ceramic or plastic insulation. Depending on the end-use, one of three process can be used to "print" the circuit: die-stamping, photoengraving, or silk screening. In some cases, resistances and inductances can be printed as part of the circuit.

The printed circuit guarantees accurate circuitry, eliminates any chance of faulty connections to cause later trouble. Assembly and disassembly, whether for production or repair, are greatly speeded.

Solid-state light source • Some materials can be made to give off light. A few engineers see the possibility of whole ceilings or walls being made of light-emitting material. Such materials, still in the laboratory stage, are called solid-state light sources. (You get the same effect with so-called panel or overall lighting—putting conventional light sources behind panels of material that diffuse the light.)

MACHINERY AND EQUIPMENT

Automatic machine • Any machine that performs a job or sequence of jobs without variation from one cycle to the next. Most automatic machines are also special-purpose machines, designed and individually produced to perform certain jobs, and only those jobs.

Automatically controlled machines • Any machine whose operation is governed by a mechanism (usually a servo-system) which guarantees the performance of a job or sequence of jobs according to specified standards. While many such machines are special-purpose machines, they need not be. Automatic control on a general-purpose machine insures uniformity of results, yet permits changes over a wide range of end-products, and makes possible mass production of the machines themselves.

Multi-head machine • Broadly, this is any machine with two or more cutting tools or heads which operate either at the same time or in sequence. It is often a special-purpose machine, but it is not necessarily an automatic machine.

Automatic indexing machine • The term is used to describe a multi-head machine in which the work-piece is held in one place, and the cutting heads index forward to perform a sequence of operations. The automatic screw machine is a common example.

Transfer machine • A multi-head automatic machine which performs a sequence of operations simultaneously on a series of product-units which are automatically indexed forward from one machine station to the next.

Automatic transfer line • The transfer line is an interlocked group of multi-head, automatic machines —millers, taps, broaches, grinders, almost anything you want. Many people—including some of the equipment manufacturers—refer to the machines in a transfer line collectively as a transfer machine. The reason is simple: The whole transfer line must be designed and built as a unit.

The various machines in a transfer line perform successive operations on the same unit of product. By interlocking the machines and the handling system, it is possible to have a whole series of product-units move forward at the same time, each to the next step in the operation sequence. As each unit reaches the end of the transfer line, all operations have been performed on it.

In effect, the transfer line is a spread out transfer machine. By putting the elements in a line, more operations can be combined and larger product-units can be handled. It also makes it possible to introduce "floats" between elements in the line.

Self-indexing tools • This is an arrangement where two or more identical cutting tools are mounted on an indexing head. In this case, the head indexes automatically after a certain number of cycles (when you expect the tool to begin to wear), or when a tool breaks. It permits the non-operating tools on the head to be changed without shutting down the machine.

Jet lubrication • Sometimes called high-pressure lubrication, this involves shooting a jet of lubricant at high pressure in between the point of the cutting tool and the metal chip. Present systems operate at about 400 psi. Development is underway on systems operating at pressures of 1000 to 1500 psi. Tool wear is reduced and higher speeds are possible than with lubrication by the conventional flooding technique.

Cold lubrication • A fine jet of liquid carbon-dioxide can be used to "lubricate" a metal cutting tool. The sudden expansion of the liquid CO_2 into a gaseous form creates tremendous pressure, forces separation of tool and chip. There's also a great cooling effect, which in effect freezes both the tool and the chip. Very fine finishes are possible and extremely hard metals can be machined.

Dielectric heating • This is the term that describes a technique for heating a non-metallic substance by means of radio-frequency power (generally 5-million to 20-million cps.) It is very fast, and heats uniformly throughout the material —so there's no chance of scorching the outside in order to heat the inside. Wood-gluing is a good example of how it works: Wood is a poor conductor of heat, so it's difficult to get heat to a layer of glue between two pieces of wood. A dielectric heater will raise the temperature of both the wood and the glue by the same amount. This does no harm to the wood, but is high enough to set the glue.

Induction heating • You can heat—and melt—some metals by subjecting them to rapidly reversing electromagnetic fields. This agitates the molecules of the metal, causes heating. If the material you want to heat will not "react" directly to induction heating, you can put it in a crucible that will (provided, of course, that the melting point of the crucible is higher than the melting point of the material in it.). With frequencies of about 10,000 cps., the heating is very fast.

Mass spectrometer • A device for determining the exact chemical composition of any material. Since every chemical element has a different mass (weight per particle), the acceleration of ionized particles in a constant magnetic field will vary with the relative mass. The mass spectrometer determines the amount of material (ionized particles) traveling at each speed, converts this into relative amounts of each chemical element present in the material being analyzed.

Spectrophotometer • Another device for determining chemical composition of a material. It works on the principle that different elements absorb or reflect different amounts of light of various wavelengths. By recording the amount of light that is reflected (or absorbed), you can tell what chemical elements are present.

ATOMIC GLOSSARY—page 120.

"When was the bicycle invented?"

The Old Man Wants To Save 44 Years

By RAY W. SHERMAN

WHEN TOBIAS QUINT, plant manager of Central Manufacturing, grew weary of his problems, he sometimes sneaked down to the corner office with the sign on the door that said simply: "Mr. Peters."

Horace R. Peters was "Hod" when he started on a shoestring. Some of the old gang—Toby, Tom Calahan, Bill Carner, Red Kane —sometimes still called him that. Most of the time he was affectionately called "the Old Man."

His silvery hair glistened and he was hunched over a book when Toby opened his door. "Come in, Toby." He rolled a cigar across the desk. Toby reached for the cigar. "What you reading?"

"World Almanac."

"What's the idea? Settling an argument?"

"Just bought it. Always have a copy around."

The Old Man's finger crept down the page. He didn't look up. "Toby! If we tore down this plant and you had to start fresh, how would you build it?"

"You're going to—" Before Toby could finish the Old Man snapped:

"When was the bicycle invented?"

Toby settled back. "Go ahead, Hod. Have fun!"

The Old Man answered: "It was in 1842. And when was the safety bicycle invented, the thing that put the bicycle business on its feet?"

The Old Man didn't wait for an answer. "It was in 1886. Now!" He glared at Toby. "Why didn't the first guy make the safety and save—" he studied the figures "—forty-four years?"

Toby flicked ashes at the gaboon. "OK. Why didn't he?"

"Because—" the Old Man slapped the desk and his voice rose—"he didn't use his imagination! A wheel had always been turned by a crank on its hub. So he put the pedals on the hub of the front wheel and darned near broke his neck every time he hit a rock in the road! It took forty-four years for some bird with imagination to do it different.

"You know, Toby—" the Old Man leaned back and smiled "—I'd like to come back a hundred years from now and see what this plant would be like. I darned well know it would be different."

"This is a pretty good plant, Hod."

"Sure it's good! So was the first bicycle! But it took forty-four years—"

"So-o-o-o?" Toby drew on the Perfecto.

"The world would be different if folks used imagination!" said the Old Man. "Like the guy in the packing plant who saw a ma-

chine pumping concrete. He said: 'Why can't we pump fat?' And he did. Shoe man read a magazine story about an auto factory and reorganized his whole plant.

"How many things—" the Old Man waved an arm "—are we doing because we always did 'em that way? They told Ford he couldn't make glass in continuous production. So—he did!

"You've got a transfer machine out there that gums everything if one unit quits. Does it have to be that way? How much stuff could be made of something else? How many of the things we do don't need to be done at all? How much of what we know ain't so?"

"Hod—" Toby got up to go—"you want everybody in the plant to use more imagination. But how'm I going to get 'em—"

"That," said the Old Man, "is the $64 problem."

THE TECHNOLOGY IS READY

FOR THE FACTORY OF THE FUTURE

By ROBERT S. RICE
Industrial Production Editor

> "No question about it, plants in the future will be a lot more automatic than they are today. The trend's definite—you see it in the whole, in bits and pieces in so many plants."

That can be any smart manufacturing executive talking. Many have actually said it. They know it because they see it—often right in their own plants.

> It's obvious in the process and mass production industries. But automaticity can develop rapidly in job-lot manufacturing as well. The equipment is here; it's the concept of automatic operation that's needed.

We have to change the way we look for improvement. Most of us study one operation at a time—to find a better method of performing the same work on the same product.

> We must visualize the product in the form that makes it adaptable to automatic production. We must then envision production in total.

Completely automatic factories for job-lot manufacturing won't grow overnight. We may never have them. But there'll be many more automatic processes and operations in the future plants of these industries.

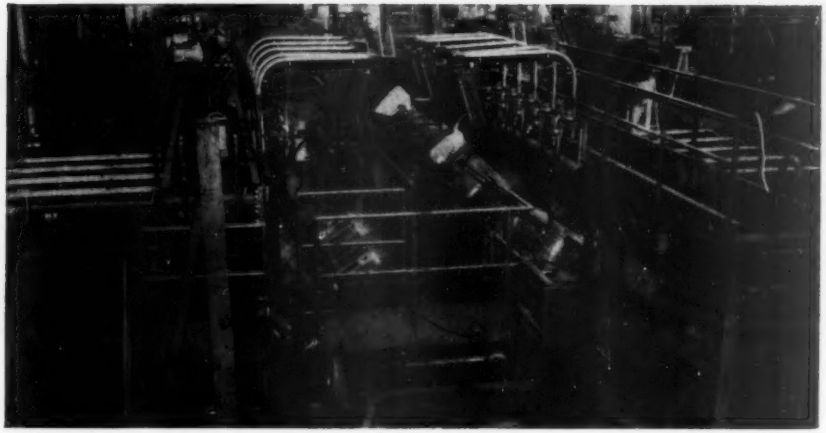
> An executive of a company making electronic controls told us: "We wouldn't go into a plant making, say, electric motors and try to sell the idea of a completely automatic plant. We'd try, instead, to sell automatic control of one, maybe several, of the individual operations. That's the way automatic production will grow."

There will be many operations that won't be automatic—at least, not in our present line of sight. But there will be better ways to perform those operations, too.

> Regardless of your type of industry—whether you can make some operations automatic, or just improve the method—this report shows you examples of equipment and methods that highlight the trends toward the factory of the future.

Turn to next page ▶

12 Things You'll Do With



COMBINING 10 grinding heads into one machine at Cadillac does the job 22 times faster than individual machines.

1 • You'll combine several operations into one ...

The machine above is the "Queen Mary" to everyone in the Cleveland Tank Plant of General Motors' Cadillac Division. "Queen Mary" is an excellent example of the trend toward combining machines to speed production. She has 10 grinding heads which operate independently, but simultaneously. They grind selected spots on tank hulls.

Cadillac has a "Queen Elizabeth," too, in Cleveland. She has 10 reciprocating drill heads of 10 drills each—drills 100 holes at one time in a hull.

These special machines reduced investment in equipment. They cut manpower requirements, saved space, reduced in-process inventory, speeded output.

The frames of these machines are custom-built. But the electrical, mechanical, and hydraulic components are standard equipment adapted to the purpose. For instance, the grinding and drilling heads are modified standard grinding heads set up to reciprocate on 30- and 45-deg. slopes.

Where do you get such machines? Cadillac executives say it takes the urge to get something on the factory floor that will do a better job, faster, and cheaper. After that, it's just a matter of directing engineering and operating people toward the development of the machine specifications.

... and 2 • You'll have to standardize your components to do that.

A lot of the work on standardization has been done for you by the Joint Industry Council (JIC).

JIC started with the Detroit automobile people. They got together with the Machine Tool Builders Association, National Electrical Manufacturers Association, and some others. They had three things in mind—type of equipment, method of installation, and safety of equipment.

JIC standards give you specifications for the application of electrical, pneumatic, and hydraulic devices to your machine tools. JIC also set up standards for tool steels, welding transformers, etc.

JIC specifications are a real break for you. You can get standardized machines and installation without specifying details. Just say you want JIC standards. You get equipment that will be easier to keep running.

Probably the biggest plus JIC gives you is the pool of information of many industries with the same common problem.

If JIC can work in the auto industry, it can work in yours.

NEW PRODUCTION EQUIPMENT

TRANSFER MACHINE at Nash-Kelvinator converts 24 operations into one big job.

3 • You'll combine operations into a continuous process

Ability to visualize built the machine shown above. Smart planning keeps it going.

Nash-Kelvinator Corporation, Detroit, bought this 24-station transfer machine to combine machining operations on compressor castings.

Designed to produce 188 pieces per hour at 80% efficiency, it consistently processes more than 200 per hour. Quality? It scraps only one or two pieces a week! There's very little tool breakage. Breakdowns are rare. Four operators control all 24 operations.

When the machine was near completion, the men who were to supervise its operation spent two weeks in the builder's plant to learn how it worked. Then they lived with the installation in their plant, again working with the builder's men. By that time they understood the machine thoroughly. The machine's excellent performance record—covering six years of 2- and 3-shift operation—proves the value of this training.

The supervisors selected the operators from their work force, trained them from scratch.

There's no special repair crew. The supervisors trained department machine repair men in preventive maintenance and repair of the machine. But they depend on the operators to keep it going.

4 • You'll really have to do preventive maintenance—and extend it to your tools.

Ford Motor Company uses a tool control board in its new Cleveland Engine Plant in the capacity of preventive maintenance. The board stores tools and automatically records life of tools in operation in multi-station transfer machines. Pre-set counting dials equipped with automatically operated lights signal warnings to machine job setter when a particular drill, reamer, or tap requires changing.

This new method of tool control avoids costly shutdowns of machines, reduces tool breakage, and improves quality of machining work. When a tool in operation in a machine reaches its life expectancy limit, the board flashes a warning light. A job setter changes the tool at an opportune time before mishap occurs.

TOOLOMETER CALLS SIGNALS for tool changing at Ford.

Begins on page 85

12 Things You'll Do With NEW PRODUCTION EQUIPMENT

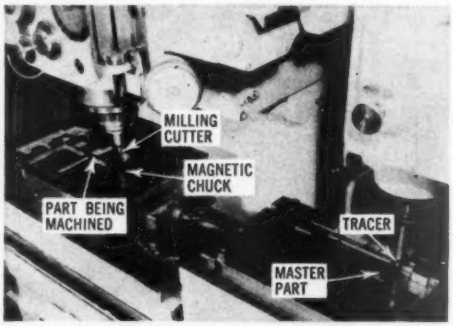
5 • You'll bring automaticity to low-volume but repetitive operations with profiling machines

You can really step up your output by using profiling machines—increases up to 600% are reported.

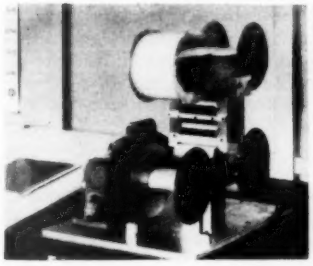
With a profiling machine, you make one master part (sometimes two—one for rough cut, one for finish). A "tracer" device moves along the profile of the master. The machine follows the same path as the tracer, duplicating the part. The method is coming into use in metalworking, but can have wide application elsewhere.

International Business Machines at Endicott, N. Y., uses the profiling miller shown at right. Different vertical levels are set by the operator, using a turret-type indicator stop.

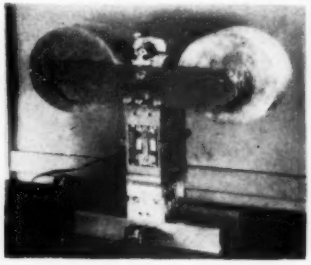
More common are tracers for engine lathes. They make it possible to cut tapers and radii without offsetting the tailstock or setting special tools. The big advantage of profiling machines: less set-up time, no rejects from undersize parts. Oversize parts are still possible from worn tools.



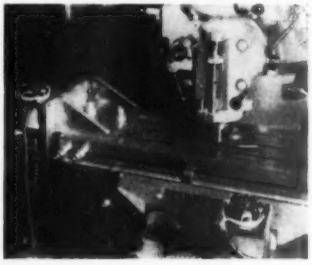
PROFILING MILLER at IBM uses the principle of tracing.



1. Specifications are punched tape . . .



2. Sensor "reads" punches in the tape . . .



3. Selsyns drive miller to make part.

6 • You'll make job-lot production automatic with robot machines

The fundamental elements of a tape-control system of machining are shown in the three photographs above. This particular one was developed by H. H. Cousins & Company, New York City.

You can apply tape control—with minor variations in the set-up—to any general purpose machine tool. Sure, it takes time to punch the tape. But not as long as it takes a skilled machinist to produce a "first part" working from blueprints—and no great skill is required.

The big advantage for the job shop or tool-and-die shop lies in the fact that once the tape has been punched, it can be filed for use weeks and even months later. When the job is to be repeated, you put the tape in the sensor and the part in the machine. The rest is automatic.

In a further refinement, you could make up master tapes for commonly used arcs, tapers, and flat surfaces. Simply fastening the

tapes together would give you a complete tape for the desired part.

Theoretical accuracy of tape controlled parts is limited only by the tools being used. In the design illustrated, the selsyn (for definition, see page 81) is geared so that each 22½-deg. rotation of its rotor advances the cross-feed 0.001 inch. If your tool is sufficiently sensitive, this could be geared down by, say, 10 to 1. But then you would need 10 times as many punches on the tape, and be forced to slow up the tape (and machine) speed.

Here's how this method works:

You take a tape wide enough to punch 16 holes across it. Each group of four holes controls a selsyn (all on one machine, or on four machines if only one is needed on each). By punching or not punching each, you get 16 possible combinations. Each combination causes a different voltage at the output of the sensor.

Sensor and selsyn are so connected that each step of applied voltage will cause the selsyn to rotate 22½-deg. and then stop. Thus the maximum possible "advance" of the selsyn from a group of holes is one revolution. To make the selsyn advance more than one revolution, you punch a second set of holes.

To face a surface on a lathe, for example, enough holes would be punched to make the selsyn keep rotating until the tool had moved from the inside to the outside diameter.

To cut a taper on an engine lathe, two parallel sets of holes are punched in the tape. One set actuates the feed screw, the second actuates the lead screw. Identical punches in the two sets of holes would result in a 45-deg. taper, and so forth.

7 • You'll run machines at higher speeds

To do so, you'll have to question—and perhaps discard—a lot of traditional rules of thumb about the materials you're working with. Take metalworking, for instance:

The new approach to determining optimum machining rates is based on the microstructure of the metal you want to cut—not on the traditional analysis or hardness.

The microstructure of a metal is its appearance under a microscope, or in a photomicrograph. The grain structure is affected by composition, working, and heat treatment of the metal.

Data presented in the Air Force Machinability Reports for 1950 and 1951 show the relationship of machining rates, tool life, and microstructure. They cover cast irons, nodular irons, and construction steels thoroughly; also some jet-engine alloys and stainless steels.

With these data, and the cooperation of metallurgist and product designer, the production supervisor can find the best machining rates and tool life for the products. It takes cooperative effort because it may be desirable—and possible—to change material specifications and heat treatment to provide a microstructure of better machinability.

In some cases, knowing optimum machining rates allows you to make more effective use of existing machines. In other cases, the knowledge will help you justify newer, faster machines.

A motor car company checked into boosting the output of a broaching operation on a casting. It found that the traditional maximum machining rate just wasn't valid, that output could be doubled over that of existing machines. Then it got a machine tool builder to make the faster equipment. This equipment eliminated the alternative of more traditional machines.

LIQUID CARBON DIOXIDE "lubricates" grinding at Tapco.

There's another factor you have to contend with when you run machines faster: damage to tools (and materials, too). You can speed up many metal-cutting operations by using liquid carbon dioxide as a "lubricant."

The technique is particularly useful where hard metals—like carbides and jet-engine alloys—are involved.

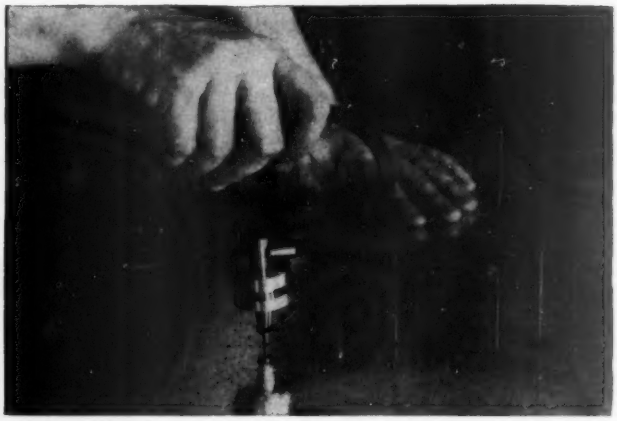
When liquid CO_2 is released into the air, it expands rapidly. (CO_2 has to be under pressure to be liquid.) For an instant, the liquid CO_2 turns into dry ice, then dissipates in the air as a gas. This "change of state" is accompanied by a cooling action which in effect freezes the tools and the work surface.

At the Tapco plant of Thompson Products, Cleveland, use of liquid CO_2 has stepped up output 50% on grinding carbide broaches. By eliminating time for cooling and changing tools, an aircraft engine maker has trimmed machine time on jet-engine tail cones from 19 to 4½ hours. *Turn the page*

Begins on page 85

12 Things You'll Do With NEW PRODUCTION EQUIPMENT

14 FACES broached in one pass at IBM.



STUD WELDER by Graham Corporation joins metals together at machine-gun speeds.

8 • For many jobs at higher speeds, you'll design new processes—not just speed up traditional ones ...

To boost output you can cut corners on present methods — with work simplification, for instance. But the important big gains in productivity come from a different approach to performing the necessary operations.

That's not a brand new concept. But it's getting more attention. The trend is toward this basis for tomorrow's methods-improvement programs. Here are some examples from today's operations.

Bachmann Uxbridge Worsted Corporation has several looms of a new type known as the Warner & Swasey weaving machine. Conventional looms use small bobbins, which are whacked back and forth through the warp threads in a shuttle. The new machine weaves directly from cones, eliminates the shuttle.

Output of the new weaving machine is 40% better than conventional looms, and may go to nearly 100%. It handles the yarn more gently—there's less abrasive action. It also makes the operator's job easier.

International Business Machines Corporation, Endicott, N. Y., developed a combination broach that finishes 14 different surfaces in one pass on the part pictured at the top of the page. Output is further boosted by clamping three parts together to process as one. This single operation replaced three separate milling operations.

IBM also took a new approach to the leveling or straightening of flat steel parts. Result: A specially built roller leveler does the work ten times faster than the old method of hammering.

A new way to assemble metal parts is possible with an automatic stud welding machine, such as one developed by Graham Manufacturing Corporation, Detroit.

It instantaneously welds one piece of metal — the stud — to another at rates up to several thousand per hour. It bonds practically any metal to any other metal — aluminum to stainless steel, or copper to aluminum, for example. The process requires no flux and no preparation of surfaces. However, the studs have a novel design feature which can be incorporated into the screw machine operation which makes them.

High-frequency or radio-frequency generators provide a source of power that's finding more and more applications for dielectric and induction heating. Both use high-frequency power.

In dielectric heating, the material is heated between two plates (electrodes). Fast heat penetration and uniform heating make it advantageous for such operations as wood gluing, drying, forming glass, fabricating plastics.

In one case, dielectric heating reduced a wood-gluing process

from three separate machine operations to one. Now, two operators simply feed and remove the wood sections. (And someone will surely make that automatic.)

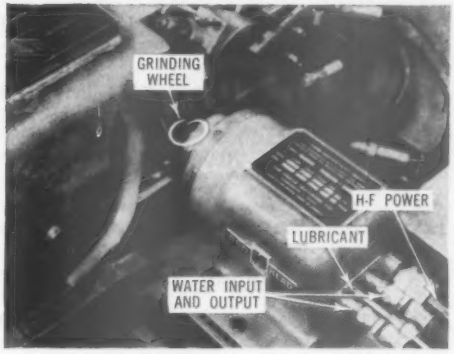
Induction heating places the part to be heated within a coil connected with the source of high frequency power. Depth and area of heating are accurately and automatically controlled. Heating is fast and uniform.

One application of induction heating solders fittings to gasoline tanks in a transfer-type machine. At each of the interlocked stations one fitting is automatically soldered in place. One operator controls the process from start to finish.

... and 9 • You'll have a practical source of ultra-high rpm.

The secret is high-frequency power. The water-cooled, oil-mist-lubricated motors range from ½ horse power at 60,000 to 100,000 rpm. to 10-plus horse power at 6000 to 7500 rpm. Dynamic balancing reduces vibration to minimum.

Heald Machine Company developed this type of wheelhead to provide a high-speed tool for small-hole internal grinding. In the photograph, the machine is automatically grinding a very small bearing race at 100,000 rpm. The larger and slower (but still fast) wheelheads grind larger bores.



HIGH-FREQUENCY WHEELHEAD grinds at 100,000 rpm.

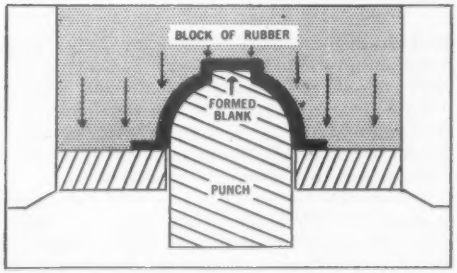
10 • You'll redesign your product for ease of manufacture and upkeep

The printed circuit is a good example of the type of design change that simplifies both product and machine component. In one case it will help make automatic, or near-automatic, operation. In the other it will speed repairs, and cut the vital downtime.

Printed circuits are produced in several ways. In general, such circuits consist of conductive material deposited in required patterns on ceramic or plastic insulation by silk screening, photo engraving, or stamping.

In an electronics plant, the use of printed circuits reduced one assembly from 99 to only 20 parts. It eliminated a considerable amount of handling, assembly, and soldering.

One printed circuit will eliminate several soldered connections. Control panels may be made up of several printed circuit units. When electrical trouble develops, the repair man will have only a couple connections to disconnect and connect to replace the faulty circuit. He'll probably discard it, but may repair it.



MARFORM STAMPING PROCESS uses die and rubber block.

11 • You'll use more economical methods to make small quantities

You'll always have to make some products in small quantities. But you'll use "new-approach" methods to make them cheaper. For instance, take the case of small-lot, or short-run, stampings.

One method for cutting die costs is the use of rubber in suitable form to replace the female die. Technical developments are overtaking the limita-

Begins on page 85

12 Things You'll Do With NEW PRODUCTION EQUIPMENT

tions. To date, there are three principal processes: Guerin, named for its originator; Marform, developed by The Glenn L. Martin Company; and Hydroform, developed by Cincinnati Milling Machine Company.

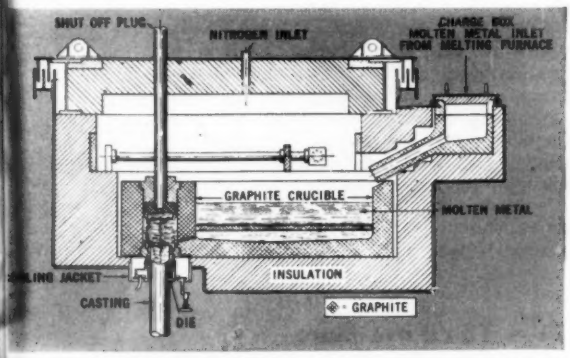
Basically, they're the same. A rubber pad serves as the female die and, under pressure, it forces the metal blank around the male punch which has the form of the product. Marform and Hydroform are both refinements of the original process. Rubber-die tool costs may be as low as 2% of regular die-sets for small-lot stamping.

For large drawn stampings, two other methods are available to cut die costs:

1. Stretch forming. This is a process of gripping a metal sheet, pulling it down over a form made of wood or Kirksite (a lead alloy). **2. Nonferrous dies.** For example, there are Kirksite and a resin-impregnated compressed wood called Densified Wood. Probably others will appear.

12 • You'll convert more processes to continuous flow . . . .

Most continuous flow processes, such as those in chemical industries, were once batch processes. Ability to conceive and execute the idea of continuous flow converted them, boosted employee output. It's not always the product that limits the method to a batch system. It takes vision and the urge to make it real.

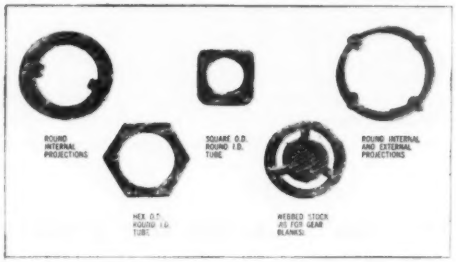


CONTINUOUS CAST rod shape emerges from die forming.

Frit-making • Ferro Corporation, Cleveland, uses vibration to help make glass enameling frit without interruption.

Molten glass flows continuously from a furnace into water-cooled rolls. They roll it into a continuous thin sheet. Vibrating conveyors shatter the glass and move it through process.

Two spiral conveyors vibrate the frit *upward*! A magnet-spring team (one pulls, the other pushes) oscillates each 10-ft.-high conveyor.


ROUND INTERNAL PROJECTIONS
SQUARE O.D. ROUND I.D. TUBE
ROUND INTERNAL AND EXTERNAL PROJECTIONS
HEX O.D. ROUND I.D. TUBE
WEBBED STOCK AS FOR GEAR BLANKS

SAMPLE SHAPES cast in continuous lengths by ASARCO.

Casting • The American Smelting and Refining Company, Barber, N. J., is continuous-casting copper-alloy rods, tubes, and shapes.

Molten metal from a melting furnace is poured into a reservoir (casting crucible) where its temperature is maintained in a nitrogen atmosphere. Clean metal flows by gravity into a self-lubricating, water-cooled graphite die. The die shapes the metal and solidifies it rapidly.

Driving rolls, directly under the die, withdraw the product continuously at controlled speed. A traveling saw cuts the bar into required lengths without stopping the process.

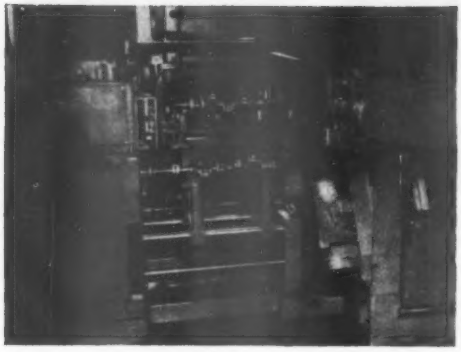
Heat treating • Simonds Abrasive Company, Philadelphia, converted curing (heat treatment) of resinoid wheels, from batch to continuous process.

Curing the green, pressed wheels requires: (1) Controlled heating up to a specified temperature; (2) soaking at even temperature; and (3) controlled cooling. Each operation takes several hours.

The new method uses one oven with three zones separated by automatic doors. Cars, on tracks, carry the wheels in a continuous train through the oven. Automatic controls open the doors within the oven. The cars move automatically .

To keep pace with faster production—

You'll Mechanize Inspection



AUTOMATIC BALANCING of auto crankshafts at DeSoto.

EXAMPLE NO 1

As almost everything starts running at higher speeds, dynamic balancing becomes more important.

De Soto has developed a method of balancing *and correcting balance* without taking parts out of the main stream of production flow.

Once loaded and started by the operator, the automatic crankshaft balancing problem machine shown at left makes decisions, does the work.

The machine automatically tests the crankshaft for balance and indicates to an attached drill the amount of drilling needed. The machine moves the crankshaft from the balancer to the drill, where the required amount of metal is removed. It then transfers the part to a second balancer for testing (and finish drilling, if necessary). Finally, the machine passes part to the next operation.

EXAMPLE NO. 2

If you can't build your testing right into the production line, specially designed test stations are the next best thing. A dynamometer set-up at DeLaval Steam Turbine Co., Trenton, makes it possible to get complete test data on a pump in 6 minutes instead of three hours.

The pump goes on a bedplate with special clamping and alignment fixtures, for quick lateral positioning. The dynamometer is on a pushbutton lift that comes within 0.022 inches of alignment with the pump shaft. Sliding-type coupling with permanent bolts allows fast connection of shafts. A movable manifold simplifies inlet connection, and the outlet discharges through a flexible hose. Both have quick-connecting adapters. A special trap keeps suction lift constant.

The test engineer works from a remote-control desk and panel. He sets flow with a button-controlled valve. His dynamometer speed is held constant by a stroboscopic light control. A voltage regulator insures constant voltage supply.

All test data can be read from instruments on the panel—lift, speed, pressure, flow, power input. By the use of selsyns, the torque exerted on a springless scale by a fixed arm on the motor can be read to the tenth of a pound. No data "corrections" are needed. The new method of testing is much more accurate.

EXAMPLE NO. 3

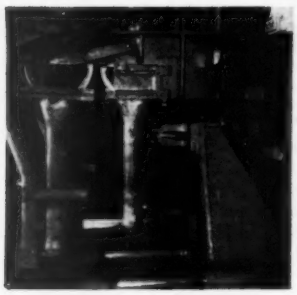
If your test or inspection requires chemical analysis, the mass spectrometer is one way to get fast action. Conversion of the readings to specific figures on chemical composition is relatively simple.

One metals producer uses a mass spectrometer to analyze small sample billets cast from a furnace remelting scrap. Results are obtained in a matter of minutes—with one woman technician instead of 22 chemists. Ability to transfer 22 chemists from test to creative work was only one advantage. The other: Right grade of metal is assured because analysis can be completed before pouring.

The high degree of sensitivity in the mass spectrometer makes it particularly useful for detecting small quantities of impurities.

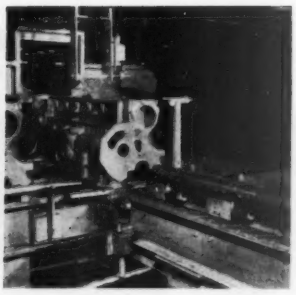
Turn the page

Begins on page 85



LOAD...
Hydraulic rams move axle housings onto carriers of overhead conveyor.

PICK UP...
"Iron hand" takes out stamping as blank is fed from back.



PULL...
Bar slides into block, "one-way" lugs engage and pull it forward.

TODAY, machines can do everything hands can do—
TOMORROW, You'll Integrate Materials

Tying together automatic materials handling systems and automatic processing equipment is so important that Ford Motor Company has invented a special word to describe it: automation.

Automation or integration, the objective is the same: Take work out of one machine and deliver it not only to but *into* the next machine without the need for manual handling.

An essential ingredient of any integrated system is an interlock arrangement that prevents jamming or pile-ups in the event of a breakdown. Take the simple case of a series of three integrated machines, A, B, and C. B breaks down. If you have made provision for a "float" on the handling system between machines, the electric interlock automatically allows A to continue producing until the float between A and B has reached capacity. And C can be kept in operation until the float between B and C is exhausted.

What integration does · Automation devices benefit production two ways:

1. Machine utilization is increased. A large part of the "downtime" on modern machines is the loading and unloading cycle. This cycle is reduced by automation devices.

2. Machines can be operated at optimum speeds. Often, manual loading and unloading cannot keep pace with the optimum speed of the machine. An automation device can keep pace without tiring.

Here's an example of what these higher speeds can mean in terms of hourly production:

Ford proposes to operate the machining lines for its overhead-valve, six-cylinder engine at more efficient rates than previously attained in the automotive industry. Some of this speed will come from new machines, to be sure, rather than automation itself. But Ford people credit automation with almost the entire increase on the basis that many of the new machines would not be as practical without automation.

Tool setters (who change tools when dull or broken) and maintenance men will be necessary to operate the automated line at the new Ford engine plant in Cleveland. But the conventional "operator" or stock handler is not required.

ADVANTAGES OF INTEGRATION

Reduction of manual handling is only one advantage—and a lot of people believe it's one of the less important. Among the others:

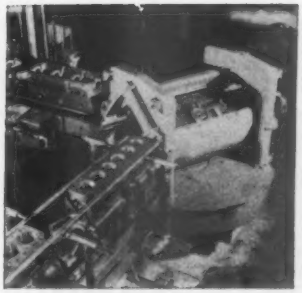
Quality is improved · Less scrap is produced because proper positioning of material or parts in the machines is assured. Parts cannot bump each other, drop on the floor, or get damaged in handling.

Safety is improved · Many parts are cumbersome. Others have sharp or ragged edges. When an automation devices handles parts, there are no cut hands or ruptures. Some companies consider better safety alone to be reason enough for automation.

Space is saved · In a new plant layout, particularly, integration may reduce floor space by 25% or more. Working space for loaders and unloaders is not needed. Many times, large radius turns can be eliminated.

Machine investment per unit of production is reduced · Loading and unloading time is less, so

SELECT...
Rotating table "combines" output of two lines, from left and from above.



INVERT...
Revolving holder inverts block, automatically puts it on next "line."

DISTRIBUTE...
Dividers on belt conveyor assure supply of pistons to each machine.

Handling With Processing

utilization is higher. Machines can be run at optimum speeds. Downtime or slowdown for operator relief is eliminated.

PROBLEMS OF INTEGRATION

Just as labor saving has been over-emphasized as an advantage, "finding" enough people with the required skill has been over-emphasized as a problem. It's a problem, all right. But it hasn't really licked anyone yet.

In an existing plant, ordinary machine operators can be trained and upgraded to automation or machine maintenance specialists. In a new plant, especially in a new location, you have to start by recruiting a core of seasoned men (usually from the home plant) to perform the work initially and to establish training schedules for additional men needed later.

Apprenticeship courses for electrical and hydraulic repairmen, general machinists, and toolmakers will be necessary. But such courses have been necessary in the past, and have been carried on successfully in even the smallest shops.

Here are the other problems you'll have to keep your eye on:

Maintenance is increased · If a department is 100% automatic, a failure in any one machine or automation device may mean a shutdown of the entire shop. Experience has shown that with preventive maintenance, this is not the bugaboo some people expected. And parts banks between machines can keep portions of the line running for a short time—long enough to make a big percentage of repairs if your maintenance crew is really on the ball.

Careful coordination is needed · It is essential that all engineering groups work as a team. Plant layout, tool-and-die design and machinery design, as well as industrial or process engineering must understand the integration concept.

The automation engineer must know materials handling, machine design principles, and a good deal about shop practice. Impractical designs can be costly as well as irritating when put into production, and failures can create enough ill will in the shop to kill the whole idea.

Automation devices are specialized · Each automation job is tailor-made. As experience is gained, of course, the designer will begin to get a pattern of how to apply standard cylinders, valves, limit switches, etc., over and over again, along with well-recognized mechanical elements. Until then, equipment costs will be high and the maintenance problem will be substantial.

THE FUTURE OF INTEGRATION

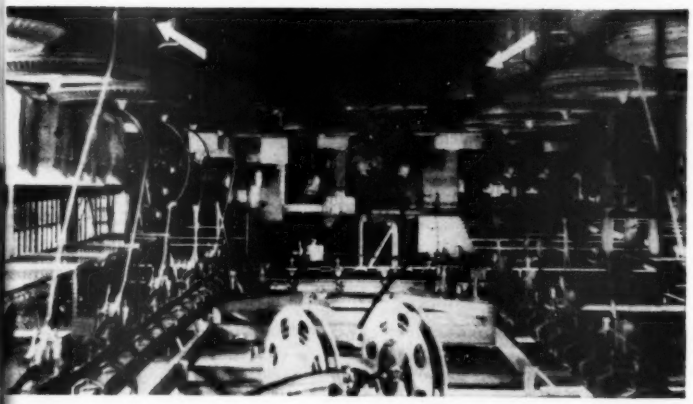
So far, integration has had its greatest play in the mass producing industries, especially in the automotive industry, and particularly at Ford.

The next step, already showing up in isolated cases, is application to parts of high-volume lines and to bottleneck operations.

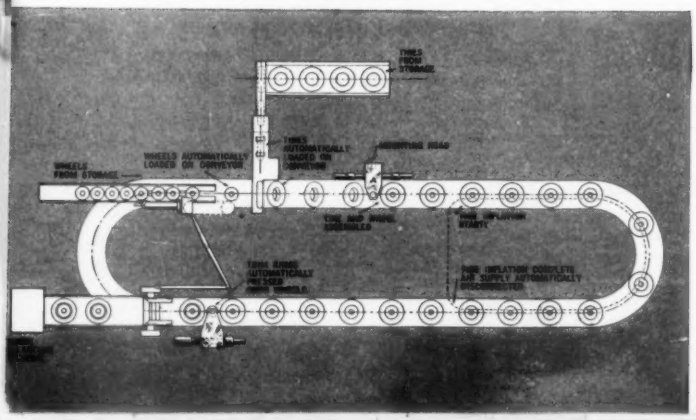
But the present inflexible nature of automation devices is not necessarily permanent. The piston plant described on page 74 is based on automation devices that can accommodate a variety of products.

Turn the page

Good Handling...



...Can Be Better


TIRES FROM STORAGE
WHEELS FROM STORAGE
WHEELS AUTOMATICALLY LOADED ON CONVEYOR
TIRES AUTOMATICALLY RACKED ON CONVEYOR
MOUNTING HEAD
TIRE AND WHEEL ASSEMBLIES
TIRE INFLATION STARTS
TIRE AXIAL AUTOMATICALLY PRESSED INTO WHEEL
TIRE INFLATION COMPLETE; AIR SUPPLY AUTOMATICALLY DISCONNECTED

MOUNTING TIRES ON WHEELS

OLD WAY · Here's an example of good handling made better—from the experience of Leonard J. Bishop, Mechanical Handling Systems, Inc., Detroit.

Mechanical handling aids, including roller and overhead conveyors, minimized manual handling in this tire mounting process.

But even with mechanization, an output of 3200 assembled tires and wheels a shift required 16 operators, three mounting machines, and much floor space.

Some of the manually performed operations took a great deal of physical effort, also caused pinching of some tubes.

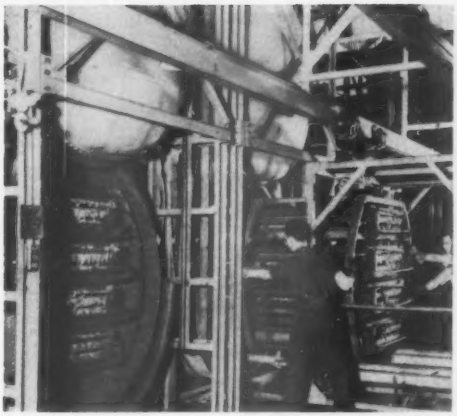
NEW WAY · Mechanized materials handling is applied to the operations, as well as to the movement of tires and wheels. Now less than half the number of operators produce 12½% more in less space, with less effort—seldom pinch a tube.

In the photo (left) you don't see any operators. That's because the operation is automatic at this point. Compressed air to inflate the tubes is carried through a traveling line attached to an overhead conveyor. Air enters this line through two flexible lines attached to self-adjusting reels at the center of the conveyor path. The air enters the tubes through outlets from the traveling line.

An operator fastens the air outlet to the tube valve. But when the tube is inflated, the outlet is automatically detached.

HOW IT WAS DONE · Key to the new method was the concept of integrating all handling within each operation as well as between operations.

Now mechanical devices perform nearly all the work while tires and wheels move along. Conveyor speed and timing of the operations balance. Operators do a few simple tasks.



BEFORE • Conveyors helped to handle the foam rubber. But handling operations weren't related.

AFTER • Conveyors move the products continuously through and between the operations in a balanced process.

HANDLING FOAM RUBBER PRODUCTS

Another of Mr. Bishop's better handling examples is this case of the molding of foam rubber products. Previously, it was layed out as a batch process. Materials handling didn't look bad because trucks and conveyors minimized manual labor. But handling between operations and handling within the operations were treated as separate problems—weren't related.

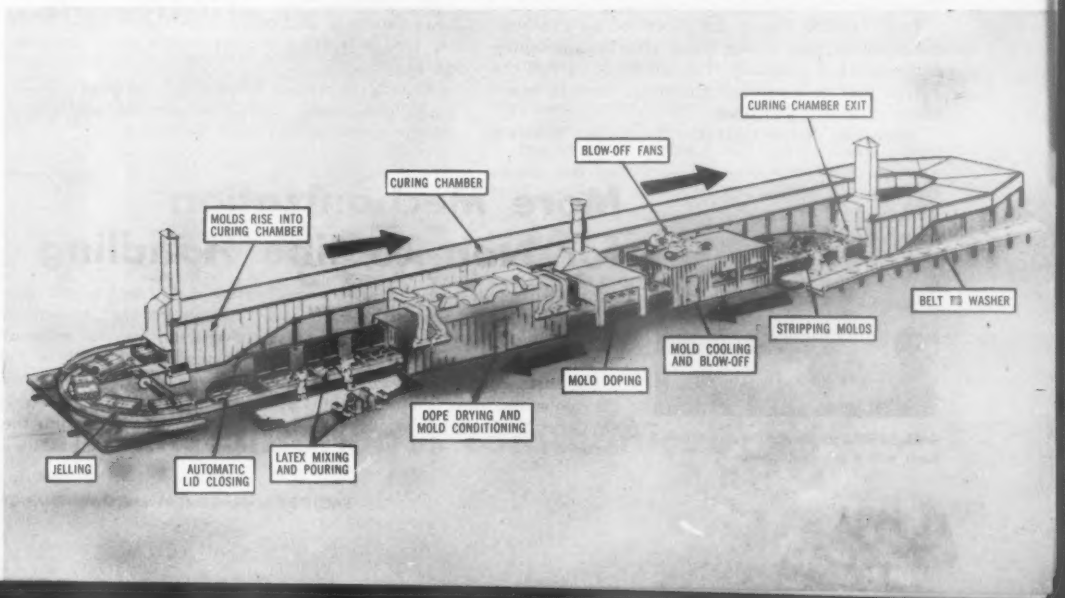
The key to the new method is a continuous conveyor. It carries the new, specially designed molds through mold conditioning, latex pouring, and curing operations. Another conveyor receives the products as they're stripped from the molds, carries them through washing and drying operations.

An unusual feature of this production line is its flexibility. It produces products that range from 4 to 30 pounds of latex. The molds to make them vary from 1,000 pounds to a ton each. The speed of the conveyor is changed to suit the product.

By this method 4 operators handle 300,000 to 400,000 pounds of molds and rubber per hour.

Turn the page

HOW IT WAS DONE • Two powered conveyors tie all the operations together into one production unit. One carries the molds; the other takes products through finishing.



BACKGROUND

When you read an issue of FACTORY, you see only the tip of the iceberg. Unprinted is the vast and varied body of research that underlies it. This April issue, dealing with the factory of the future, presented extraordinary problems of sampling, checking, and cross-checking. Our editors talked to hundreds of thinking men in industries of almost every size and type, and in leading engineering colleges.

While we may not agree with all that they see ahead for the next 8 or 10 or even 20 years, we can say with assurance that they are men well qualified to have opinions about the future.

So many of these "background interviews" were just plain fascinating that we're sampling for you from a few field reports as received from our editors. No commas added -- just names omitted.

ALFRED M. STAEHLE
PUBLISHER

PACE OF TECHNOLOGY TODAY

There were two themes that seemed to run through almost everything I was told by the various people here at _____.
1. The rate of technological change is increasing very rapidly. This was frequently stated in its converse form, which is that the rate of technological obsolescence is increasing very rapidly. These observations apply right across the board, and are being felt in terms of equipment, processes, buildings, and management.
2. The amount of technical information that is necessary to survive in the industrial world of today is getting to be so great that more and more reliance must be placed on specialists who do not and cannot be expected to see the whole problem at any time. There are several other ways of looking at this same thing, and it was stated to me in half-a-dozen variations. One of the more significant variations is this: More and more, the decisions that affect the whole life and even survival of a company will have to be made by the technical and operating experts working at the secondary level of management. Still another way of putting it is this: The biggest single job of industrial management in the future will be selecting and coordinating the activities of specialists.

* * *

STARTING THE BIG ONES

In terms of industries other than those using the traditional flow process, _____ believes that the first big application of complex control equipment will be applied to very heavy machinery. He says the controls will be not nearly so much for the purpose of operating the machinery as for starting and stopping the machinery. As machines get very large and very heavy, the problem of inertia in stopping and starting becomes one of the most difficult ones. Simply to throw a switch which connects an electric circuit and starts the machine in operation may well be to court disaster.

NEW WOOD-TO-STEEL BOND

We can't use the name of the manufacturer, because the system is not yet in full production, but the _____ Co. is about to start making its own TV cabinets. Instead of paying the tremendous freight charges for moving cabinets to its TV assembly plant, they will simply bring in pieces of pre-cut plywood and tackweld a light steel frame. All they do from that point on is slap the pieces of plywood over the frame with this new adhesive bonding agent in between, and 45 min. later they have a finished TV cabinet. Actually this is going to cause a fairly substantial change in their whole manufacturing layout, but it will not bring about any substantial changes in the manufacturing methods used in the plant.

* * *

TOMORROW'S BUILDING

_____ thinks the day of the plant building, as such, is pretty much past. He says buildings will be used only for a few remaining industries where many people of high skill are required for the work that is being done. Furthermore, he adds, the number of such industries is steadily decreasing. He thinks most operations will be placed outdoors, with protective enclosures for control apparatus, and perhaps a building for a maintenance shop and a small administrative office. He bases his conclusion on the fact that technological change is going to be so rapid that we won't be able to afford to build factory plants in the present sense of the word to house ever-changing equipment. He puts it about like this:

"It won't be too long before a company will just go out into the country and buy a whopping big piece of land. Then they will divide it into four sections. On the first they will put a small administrative building, their maintenance shops, power house and things of that sort. On the other three sections they will be tearing down one manufacturing operation while they are actually producing on the second piece of land, at the same time they are building a still more advanced manufacturing operation on the third section, so that it will be just a continual circle of one, two, three, or everything going on simultaneously."

I think this is a little far-fetched, but the guy does have an interesting idea. And actually it is only a one-step extension of the process that is already being carried out by the automotive industry, where we always see the process of tooling up for one year's models going on, while the previous year's models are being produced.

* * *

THE STERILE FACTORY

I tried out on _____ the idea of using ultraviolet light on a fairly broad scale in industry to sterilize the atmosphere and perhaps thereby reduce the incidence of disease among workers. His reaction was rather violent. He said that for specific sterilizing purposes the ultraviolet light and other sterilizers may have very valuable uses, but that there would be a grave danger involved in sterilizing the entire atmosphere in which a person spent 8 hours a day. He said the human body has not only built up a resistance to many of the germs and bacteria that are constantly present in the air, but in doing so had developed a mechanism that actually requires the continual introduction of those germs and bacteria into the system. He said to put a human being into a totally sterile atmosphere would probably create at least ten times as many diseases as it cures.

OVER-STANDARDIZED

_____thinks that, more and more, the design, equipment, and layout of plants will represent an individual approach to a particular production problem. He says the potential economics of standardization have been vastly over-rated. As an example he cites the case of an electric motor. He says most electric motors burn up their initial cost in electricity in from one to two months. On that basis, a special electric motor will return its cost very rapidly if it can perform at only 2% or 3% greater efficiency than a standard electric motor.

* * *

FORCED FEEDING OF ECONOMICS

_____ talked quite bitterly about such things as stuffers in pay envelopes, "economic preachments" in employee publications, and mailing "economic treatises, no matter how well done" to employees' homes. He really went off the deep end in denouncing attempts at economic education by talking to "captive audiences" of employees. But, he said, if you can get an employee to pick up a piece of economic literature, there is a fair chance that he will read it with an open mind.

_____ sums it up like: "If you can once get the word around the plant that there is a good booklet on how to prepare a hundred different cheap meals, or a lot of different ideas for styles of women's clothes that can be home-sewn, or something of that kind, then you can get the employee in the habit of going over and actually picking up information that we place on the racks. Then you really begin to get some place when you start including on the rack certain items that are basically aimed at economic education."

* * *

TELEVISION FOR IN-PLANT TRAINING

There's going to have to be a lot of training in the factory of the future. How better can an instructor demonstrate maintenance of machines to a group of mechanics than by using television? Instead of having to instruct a small group of five or six men grouped around a machine, he can now instruct groups of 30 or 40 men. They'll be in a classroom away from the manufacturing area. He'll be right out at the machine.

* * *

FREE RIDE ON THE SUN?

_____ did not like to be tied down to any specific predictions as far as the application of solar energy for industrial heating was concerned. About as far as he would go was this: "There doesn't seem to be much possibility for it in any situation where a uniform heat supply is an absolute requirement." If, however, you have some process heat that could be made available for supplementary heating of factory space in the event you got in trouble with a deficiency of solar heat, then he thinks there is some commercial possibility for solar energy as a source of heating factory space. He re-emphasized that this would be pretty much limited to the southern and southern-border states.

The other factor that would operate against the use of solar energy for industrial use is the high initial cost. He estimated you would have to have a building life of at least 20 years in order to make solar heating economically attractive -- "and buildings you expect to last 20 years will be few and far between."

LESS BRICK-HITTING

_____, the personnel manager at _____ Co., says that many of their former difficulties with regard to having one man operating two or more machines have completely evaporated since the introduction in the labor contract of the "GM-type" annual productivity increase in wages. He says: "We used to have to fight tooth and nail for some of those things, but last year we didn't hear so much as a peep when we brought in some new machines and scheduled one man to run four machines. I can remember the day when the boys would have been ready to hit the bricks for that."

* * *

DE-IONIZE TO MAKE 'EM FEEL BETTER

The most challenging idea that _____ tried out on me was this: He says that experiments that have been taking place almost around the world definitely indicate a relationship between the degree of ionization in the air and such seemingly unrelated factors as resistance to disease, the threshold of pain, the mental capacity for accepting challenge, and our ability to maintain good relationships at the personal level with one another. Although it is a little bit more tenuous, _____ says that he is satisfied that a relationship can be demonstrated between ionization and enthusiasm.

He says that very definitely such things as arthritic pains becoming more acute in damp weather, and old scars and injuries being painful in damp, cold weather is not at all a function of temperature and humidity, but rather is a function of the degree of ionization of the air which is generally, although not always, highly ionized in periods of damp, cold weather. _____ says several papers have been presented at one time and another over the past 10 or more years to some of the scientific societies in the heating and ventilating field having to do with this problem of controlling ionization of the air. He says he believes there is an opportunity for tremendous advances to be made in terms of stimulating greater effort both mentally and physically in industry, where it would be possible to control the degree of ionization in a fully air-conditioned plant.

He says the report is totally unconfirmed, but he has heard from "three or four" sources that the Russians have a couple of experimental plants in which they are controlling ionization of the atmosphere and are achieving remarkable results.

* * *

LOWER-LEVEL DECISIONS

In terms of production, _____ expresses the opinion that we are going to get away from the era when a man will operate a machine, and are entering the era when even the lowliest form of workman (that's not his expression, and he would react violently to it) will manage his machine.

* * *

"NOT AT THE CORNER DRUGSTORE"

Some advice from _____, v.p. of sales, _____ Co.:

"You would be ridiculous to advise all readers: 'You're old-fashioned -- get out and make yourself an automatic factory.' Sure, one has to give it thought and planning. But few can do it right now. We don't have a single 100% case we can release to you. Don't imply that your readers can get an automatic factory at the corner drugstore". [Furthest thing from our intention.-- EDITOR]

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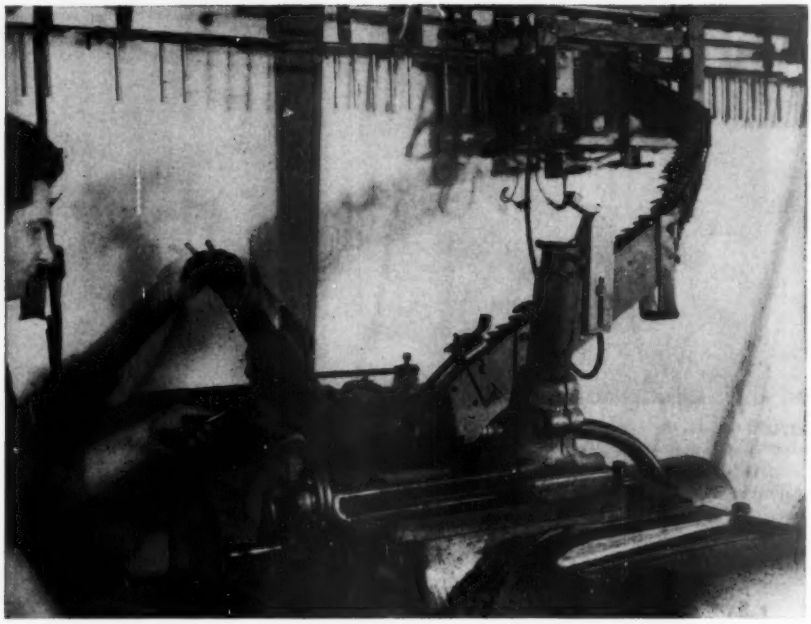
Begins on page 85



AUTOMATIC CONVEYING and machine feeding system integrates handling and processing of valves at Tapco. The operator merely checks product and operation.

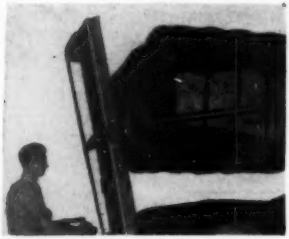
Marrying Processing and Handling

Automation of the Tapco Division automotive valve line cut labor 25%, boosted output 5% to 10% for Thompson Products, Inc., Cleveland.

Two inspectors hang the valves on an overhead conveyor as they check them after straightening and centerless grinding. The conveyor carries the valves first to centerless grinding, then to automatic chucking machines.

When one of the machines (centerless grinders and automatic chucking machines) ejects a valve another falls into position from a feed trough above. Then "pick-up fingers" take a valve from the overhead conveyor and place it in the trough. When the trough is filled, a limit switch stops the pick-up fingers.

Tapco's engineers believe this process can be made completely automatic, see no mechanical control problem that can't be solved.



ONE TRUCK can handle bulk or pallet loads with a universal clamp.

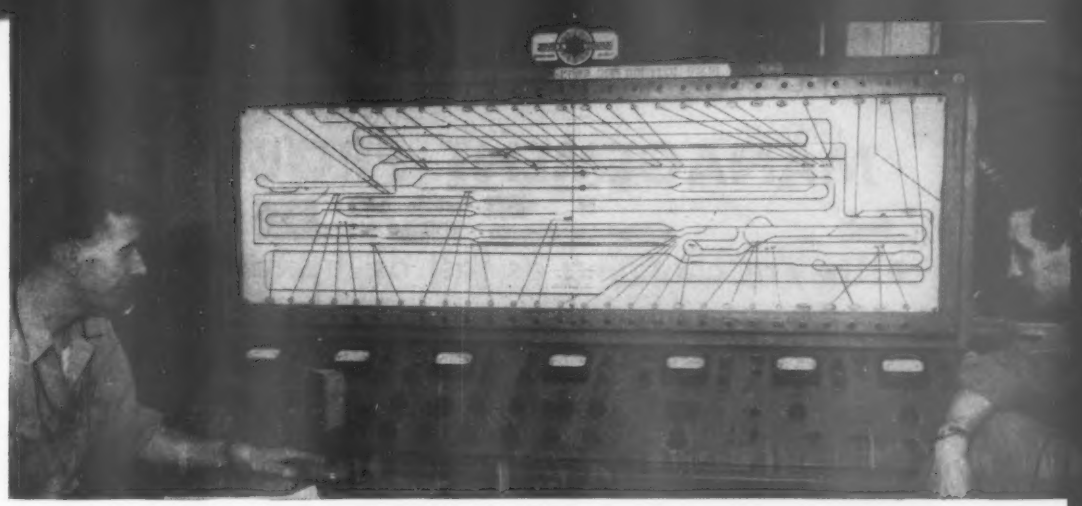
More Mechanization for Non-Routine Handling

Realistically, *all* your materials handling won't be automatic. But manual handling will be scarce in the factory of the future.

For instance: Trucks will handle tools and dies, maintenance equipment, warehouse stocks—to name a few.

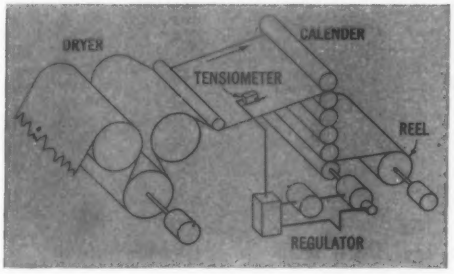
The trend will be toward one-piece equipment that will do a variety of handling jobs without time-consuming changes.

Trucks may even have "Boy Scout knife" utility. The idea is to design fast flexibility into the equipment.



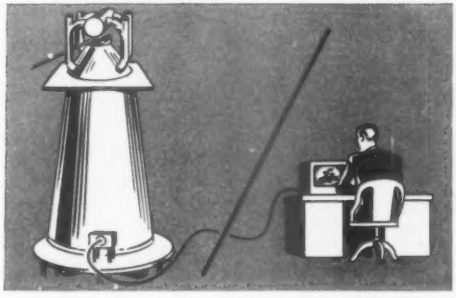
OPERATORS MERELY WATCH the control panel for signals that spell trouble on the DeSoto body plant power-and-free conveyor system. They quickly dispatch repair men to the scene.

You'll keep production moving with...



TENSIOMETER and regulator control paper tension automatically.

...automatic controls



INDUSTRIAL TV will show you what's going on inside a process.

...and instantaneous communication

. . . **A signal panel** · One helps the DeSoto Motor Corporation keep downtime down in its Detroit body plant. The panel is wired to the power-and-free conveyor system, signals the central control crew (photo above) by light when something's wrong.

The central crew sounds a horn at a plant station nearest the trouble to call a repair man. When he answers on the intercom (promptly), the crew gives him instructions.

The area man can also call central control, and central can call other maintenance units for help.

. . . **Tension control** · It's important in making paper to eliminate breaks which waste time and material. That's why the P. H. Glatfelter Company, Spring Grove, Pa., uses a tensiometer to measure tension. It made control completely automatic by adding a regulator, which takes signals from the tensiometer, converts them to machine adjustments to maintain constant tension.

The combination of indicator and self-adjusting regulator (servo system) has many potential applications—in all industries.

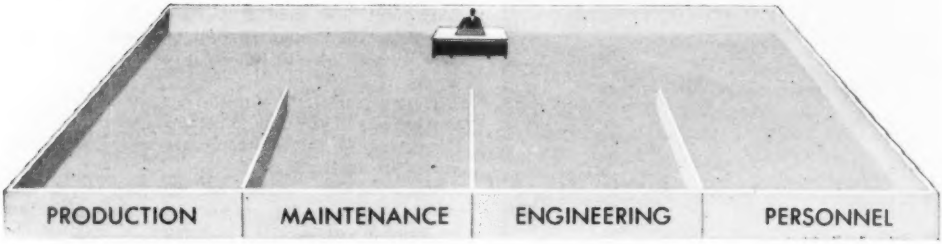
. . . **Industrial television** · ITV can be many places where you need only eyes to control operations. Here are some suggestions: Observe action inside stills, furnaces, boilers; remotely control operations where there's heat, noise, fumes, dust, or potential explosion; observe several operations from one point; train employees "on the job" while they're in a classroom; hold conferences; transmit information; protect the plant against intrusion. Once again, it's largely a matter of vision.

MANAGEMENT PROBLEMS

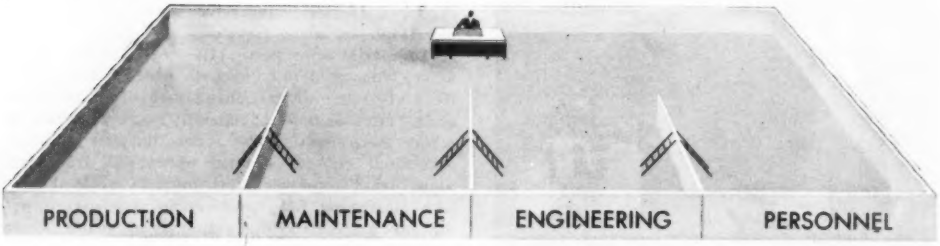
- They're changing as fast as the factory itself
- Everything you do to get set for tomorrow will help you today

By M. J. MURPHY • Industrial Relations Editor

First, take a fresh look at the whole problem of plant organization. **To organize is to build fences — so that problems between departments necessarily channel through higher management. That's ABC — and, highly simplified, it looks something like this . . .**

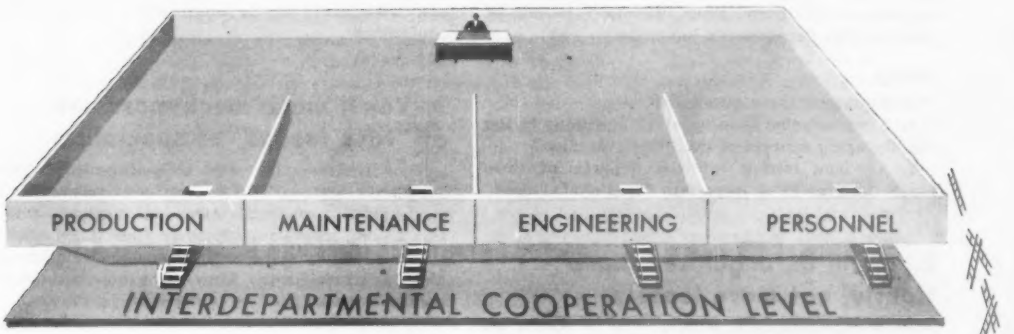


The trouble is, it's a little *too* simply organized. Many interdepartment problems don't merit higher management attention. So jumping the fences is permitted for such matters . . .



That's all right up to a point. But as complexity of interdepartment problems grows, fence-jumping isn't the answer. *New provision must be made for handling the vastly increased number of lower-*

level interdepartment decisions. **A new dimension must be added to the organization . . .**



This new dimension is added by redefining responsibilities so that more routine operating decisions will be made farther down the line. But automaticity brings with it not only *more* problems, but also *new* problems — and in most plants there is not now any group or groups specifically assigned to the solution of these new, non-routine problems. What is needed is some basis whereby highly trained specialists can operate company-wide, independent of departmental or functional loyalties — individually or as "task forces." These people, too, must cross department fences and cross them on a level of their own . . .

Now let's take a look at all this in more detail . . .

1. You'll re-evaluate functions.

Production is always going to be important, of course. But other functions of the plant of the future are going to pull right up even with it—or even pass it.

Why? It's a big job just to engineer the technological improvements of the plant of the future. *But it's a far bigger job to cope with them, once*

they're in. Servicing, maintaining, scheduling, and controlling them will be jobs of unprecedented importance. Actually, production may be one of your smaller departments tomorrow.

Today:

Ask yourself these questions:

1. Are you subordinating other functions to the rapidly aging concept of one "line" function?

2. Are you letting artificial department lines block the growth of important functions?

2. You'll be organized more tightly, not more loosely.

Because tomorrow's factory will be based on closer teamwork between *machines*, it will require closer teamwork between *people*.

How will you get it? First reaction of many people is that you must loosen up the organization, blot out department lines, be less precise in defining jobs and department functions.

Just the opposite is the case. As one operating executive puts it:

"We've found you need to streamline your organization when you 'go automatic.' That's one of the big early problems. What you need is something like the Navy's plan of organization—'a system set up by geniuses for idiots.'

"I don't mean you'll be hiring idiots. Far from it. But you'll have to move so fast and with such precision in the factory of the future that you can't possibly have a complicated, muddled organization. It's going to have to be so simple that *anybody* can understand it."

In plants that already have plenty of automatic equipment, you see one unvarying goal—*to keep that equipment running.* Teamwork is no longer something you talk about. It's the way you live.

Today:

This thing is coming. To many it poses the question: Are you going to get set so you can hop on and take a ride? Or is it going to run over you?

1. There'll be no room tomorrow for "little kingdoms" or "little Napoleons." Take a look at your map. Maybe it needs some redrawing of boundaries —maybe just a clearer definition of them.

2. Where teamwork's involved, a few bad apples can spoil the barrel fast. It's never too soon to cull. What's a man's "teamwork IQ"? Maybe he's just not the type—maybe *you* haven't brought him up right. In the long run, you only hit what you aim at—so set up targets now.

3. Who does what and why? Maybe you've been smart enough to get along without worrying too much about this one. If so, face up to the fact that you can't do it tomorrow. Start putting the whole thing on paper now. If it's not there, it won't be anywhere.

4. Start planning to have decisions made further down the line. When a shutdown anywhere is a shutdown everywhere, there won't be time for conferences.

3. You'll make much more use of "task forces" of specialists.

They'll serve your key technological centers. They'll be part of the answer to how you can easily get fast communications and good coordination among men with variously specialized backgrounds. And you'll find the specialist team idea a fine way to train men. They learn more about one another's specialties by close association.

- **Arma Corporation** uses "design teams" for each job it engineers. Each team sticks on the job, works with production engineers and everyone else needed to get production wrinkles ironed out.
- **Dow Chemical** uses "instrument crews" to repair and maintain complicated control and recording equipment. The company's plants are full of instruments. This method works well.

What stands out in these cases is that the task force idea is *consciously planned* as a way to meet changing and more complex operating conditions.

Today:

Many authorities say that the biggest single management job in the factory of the future will be the selection and coordination of the activities of highly trained specialists.

Think of the team concept as a simple way to get the integration of effort and knowledge you need right now. Closely related is the equally effective device for higher plant levels—the committee. As one user of the committee idea puts it:

"We're getting closer than we've ever been before. Departmental lines don't interfere as much as they used to. We like it. We're learning from it. And we're making money with it."

4. You'll put more emphasis on fast communications.

At the same time, you'll rely more heavily on the guided exercise of initiative and good judgment by key people at all levels.

The amount of technical information needed to get along in the industrial world of tomorrow is going to be too great for any one man to possess. In many plants that's already true. So, more and more, the decisions that affect the welfare—even the survival—of a company will have to be made by technical experts, operating at relatively low management levels.

To make decisions, to get fast operating results,

two-way communication at lightning-fast pace is needed. The marked trend of recent years toward streamlining the *mechanics* of communication just begins to hint at what's coming.

In the past two years there has been a 200% increase in federal licenses to plants for 2-way radio systems. There were close to 12,000 such licenses on January 1 of this year. "Personal teletype," two-way facsimile machines in desk-model styles, and untold possibilities of television application point the direction of high-speed communications of the future.

This emphasis on speed is going to run right down the line. It already has in many technologically advanced plants. For example:

• **One highly mechanized plant uses the Navy's "disaster control" concept** to maintain its power-and-free-conveyor system. The whole plan is based on instantaneous communication between personnel in all "sectors," and instantaneous news of operating trouble (via limit switches and other devices interlocked with electrical control panel signals). Seconds after trouble develops hordes of specialists are alerted to descend on the scene.

Today:

1. Be sure you have the mechanics of fast communication that your plant needs.

2. Then make sure the management of communication is sound. The incentive for free, fast exchange of ideas and information must come from the level of the plant operating executive. If you get—but don't give—information, if you insist on miles of red tape, you'll certainly limp along as far as communication is concerned. It's up to you to clear the way.

5. You'll pay bigger penalties for planning failures.

Ability to plan ahead, to see every potentiality, to anticipate troubles is your biggest management job today. As technological improvements continue, the job is going to be tougher.

You can engineer technology right down to the last detail, then mismanage it right into the ground.

• **"X" Company has had a largely automatic plant running for more than a year.** The plant is really one long machine, combining all types of operations, including automatic gaging.

How's the plant doing after more than a year? Management people say they're still in the process of "ironing the bugs out." They're running at about a sixth of a conservative operating efficiency goal. They have several times as many people in the plant as they had planned. They say now that they'll never get down to anything like the number of workers originally expected.

Why? Simply because management missed the boat at the very beginning—the planning stage.

The present set-up *looks* good, and it *sounds* good. But the results simply aren't there. And the mess can't be straightened out just by making a few changes here and there. Every change seems to require several others. As it stands now, it looks like an almost endless process of cut-and-try changes.

Even now this management isn't concentrating on integrated planning of its corrective program. It seems to be wasting energy just running around putting out a lot of little fires.

Today:

If you haven't long since done so, now's a good time to change your ideas of the kind of planning you ought to be doing as an operating executive.

6. You'll be less tolerant of second-raters in management.

"The plant of the future will separate the men from the boys—fast. The demand for brains, adaptability, skill at timing, and technical know-how will be so great that there will be even less room than there is today for second-raters."

That's the conclusion of a man who has visited hundreds of plants in the past several years—himself an operating executive and president of a small company.

It's practically the universal conclusion of everyone you talk to who has had operating experience in technologically advanced plants.

But this business of "second-rater allergy" goes beyond the requirement of brains, adaptability, timing, and technical know-how at every management level.

You need something else. For example:

• **De Soto Motors Corporation,** where a big part of the engine plant is already practically a "push-button plant," defines this "something else" like this. Says Sheldon Kavieff, assistant plant engineer:

"We think *attitudes* are our greatest asset—willingness to admit things *can* be done. To us, that's an overriding requirement. We *must* have men who spark to ideas. We can't tolerate men whose first thought is to figure out a million reasons why something is impossible."

Today:

1. Start with yourself. You're not a "second-rater," of course. But the way you develop first-rate people is to be the sparkplug yourself. Just be sure *you're* not tagged as the "it can't be done" bottleneck of your plant or department.

2. You're on the beam? Then the next step is to go to work on your key people.

3. How? The answer will vary with you, your people and your plant. But, getting back to De Soto, here's how they've done it with one group:

"We've been pretty successful in developing our

young engineers. We want them to be real self-starters, confident, forward-looking. We pick them carefully, of course. But then we vest responsibility in them right from the start. By putting them as much on their own as we can, we get the extra qualities we're trying to build—*the forward look, the initiative, the confidence, the ability to understand and get along with people that our progress demands.* We don't care about experience. We can give that."

7. You'll have to have higher-skilled workers.

You'll probably have fewer of them, per unit of output. But you'll be making a big mistake to expect that machines are going to wipe out the need for human skills in the factory of the future. It's not going to be that simple, or that easy.

Here's why, in the words of men who have experience with automatic production.

• **"Automatic production does not eliminate the need for skilled work and skilled workers.** *It transfers the skills.* True, we can use semi-skilled labor at the operator level. But we'll need even higher skill to understand and maintain the machines, and to make the tools for the machines." (O. E. Carlson, vice president, Servo-Tek Products Company, Inc.)

• **"Automation can and has made substantial reductions in labor.** It relieves the manual effort required to handle parts, especially in large-volume operations. Although it may not eliminate labor, it removes human drudgery from production operations, *shifts men to skilled service work.*" ("Automation at Ford," William R. Slattery, Manufacturing Engineering Staff, Ford Motor Company.)

The jobs that are "duck soup" for elimination by automatic production are mainly the semi-skilled ones, such as machine operating and materials handling. Some observers believe the factory of the future will go so far as to wipe out this great "middle class" of industry.

Today:

1. Look around your own plant and department. Has this skill trend already overtaken you without your being particularly aware of it? Are you having real trouble finding the skills you need? If so, you may already be in the first stages of the plant of the future's skill problem.

2. Plan with this simple principle in mind: You won't find scarce skills ready-made; you're going to have to *make* them, at least in part.

3. Analyze your jobs to find out just what skills they require. Without that knowledge, you can't start the training job that's needed.

8. You'll need more highly trained technical people, too.

That will be true wherever you find such jobs, not just in the engineering and design departments. Many operating functions will also be affected. Similarly in manual skills:

Greater complexity of operating requirements simply forces you to have better technical people around you. You have to rely more on them, too.

Operating and engineering executives constantly deplore the trend toward increasing technical specialization. But they all admit that it *is* a trend.

Today:

1. Define your new jobs as the need arises—and give them status. For example: "automation engineer," "layout engineer," "materials handling engineer," "process engineer." These, and many like them, may seem to bridge departmental lines, and create confusion as to where they rightly "belong." But such confusion is minor indeed, compared to the benefits of having highly qualified specialists available to pool their technical skills in concentrated attacks on production problems.

2. Define the qualifications of the men who will supervise the activities of these highly specialized experts. These men must be broad in their technical knowledge to be able to understand the experts. But they must be broad-minded, too, to admit they don't know as much as the experts.

9. You'll have to train longer—at higher cost.

As a result, you also have to be more accurate in picking people to train. The more training you give, the more important it is to make it pay off.

The use of psychological tests for measuring the abilities, interests, and personality traits of applicants is still in its infancy. It is sure to expand enormously in the factory of the future.

The reason why training will be a hard and costly job is that its complexion is going to be changed in the factory of the future. Today the great bulk of training is done on the job. That's practical because most trainees are put on semi-skilled (often almost unskilled) jobs. What training is needed can be given quickly, consisting mainly of seeing that specific manual work is done properly. There's practically no effort to give the trainee technical background about the job.

Here's what will happen:

• **For skilled maintenance and service workers, extended training along the lines of apprenticeship will be needed.** These trainees will learn manual skills, of course. But the greater emphasis will have to be on related training—the electronics, mathematics, chemistry, and metallurgy (or other

basic sciences) required for a full understanding of their complex jobs. As one man puts it after a little experience:

"You're going to have to take the judgment out of skilled jobs in the factory of the future, or you're going to have to train as never before to give the workers the judgment they need."

• **For technical and engineering specialists, supplementary training courses in or out of the plant will be on the must list, too.** In addition, programs of guided job rotation or progression will undoubtedly be needed. Though he may have to be highly specialized, the engineer and technician of the factory of the future must know enough about other jobs and functions to be able to relate his knowledge to some extent, and to keep from making gross, easily prevented errors.

In both these situations far more emphasis will be on the kind of training that's long, hard, and costly—classroom and laboratory work. The factory of the future may not be a college, but it's going to look a lot more like one than you might think.

Today:

1. Start by analyzing the kinds of training needed for key skilled and technical jobs.

2. Then get some training actually going. That does two things: It gets your hand in, so you're more expert at it. And it develops people you need for your own future growth. You can't lose on such a plan. For example:

• **Dow Chemical Company**, Midland, Mich., uses "progression training," which is a combination of on-the-job and supplementary (classroom) training. On the job, operators and maintenance and service men learn the manual skills. In the classroom, they learn the fundamental facts and principles they need to understand the *why* of the job.

All training has a forward look to it. Every man involved has the chance to advance. That's why Dow calls its plan "progression training." Men who show up best in training and on the job advance fastest—to better jobs, and also to more advanced training for still better jobs.

Perhaps the most advanced example of the company's training philosophy is its powerhouse program. Classroom training goes on 10 months a year, year in and year out. Nobody is required to enroll after the compulsory first two years (basic course for powerhouse operators), but everybody does. When a man finishes one course, he goes on to the next. Result: The men are real engineers, not just valve turners and instrument watchers.

Dow uses tests to select employees for hire—also as one guide in selecting men for advancement. But it feels that its training program is itself the best selection device it has.

"As we train, we automatically test," says James Driver, Dow's personnel director.

10. By and large, you'll face different employee attitudes.

That's because the factory of the future is going to endow you with a more alert, more interested, more enterprising work force. They'll be good employees, and they'll keep you on your toes.

Sounds strange? Different from the traditional picture of the automatic plant with a group of moronic-looking human robots tied to their machines? Of course it's different, because the so-called "classic" picture of the automatic plant has been based on the false premise that automaticity downgrades the skill and educational requirements for employees. Actually just the opposite happens.

Jobs will be less monotonous and boring. So if you make capital of this you should get more constructive ideas and suggestions. You should find it easier to get workers interested in their jobs and their company for the very good reason that they'll have to understand both better. Your training should impress them with that.

But — and it's a *big* but — you'll also find *you* must do a better job of human relations management. Employees who have more to give demand more in turn—more informal, consultative supervision, fewer arbitrary rules, more personal interest in them as individuals and freer sharing of information. Add to these all the precepts of good personnel administration you know, and you'll have the rough dimensions of the kind of job your employees will demand of you in the future.

Today:

Here's what to do in the words of the vice president of a well-known instrument company:

• **"Automatic production is a process of evolution.** We're all somewhere along the way. As part of the process, we must keep pace with the increased education and social desires of workers. But we're also molding those desires as we raise the standard of living. So let's not forget that we have to change *our attitudes* as we grow if we're to get changes in the attitudes of others. To upgrade attitudes in the plant, you've got to upgrade your own first."

11. You'll add "bio-mechanics" to your vocabulary.

And you'll design the workplace and equipment of your plant of the future more and more in line with bio-mechanics principles.

Some scientists don't like the term bio-mechanics. They prefer to call it "human engineering." Whatever the label, the subject matter is the same:

"Human engineering is the designing and laying out of equipment with the abilities and limitations of the human operator in mind. The aim is to create a work situation in which the efficiency of the

man-machine system is at a maximum."—*Dr. J. W. Dunlap, Dunlap & Associates, Stamford, Conn.*

Much has been done to date in reducing noise levels and improving factors like heat, light, and ventilation. But progress beyond these elementary (though basic) matters has been mainly by work simplification and methods engineering.

During World War II, this went one step further through the work of scientists in medicine, biology, and psychology. Designs of plane cockpits, submarines, tanks, and other fighting equipment were radically revised to meet the human requirements involved—the kinds of information needed, the kinds of decisions to be made, and the actions required. Sizes and shapes of instrument dials were changed; knobs, levers, and other movable fixtures relocated. Everything was built around the man.

As plants get more automatic, decisions get more critical, mistakes more costly. The human factor becomes more important. So human engineering or bio-mechanics will come more and more into its own. The great progress of methods engineering to date is certain to be accelerated.

Today:

You can make a good start just by seeing that your design and industrial engineers are supplied with copies of a valuable basic guide produced by Tufts College. It's called: *Handbook of Human Engineering Data for Design Engineers.* It's not easy to read. But it will give you and your engineers an idea of the broad opportunity you have to do a better bio-mechanics job.

12. You'll judge operating efficiency by new standards.

Or at least you'll be putting new emphasis on standards you don't depend on much now. That's because with more automatic operation you'll have to emphasize the *machine* that produces the output more heavily than the *people.*

Direct labor certainly won't be important as a standard for comparison purposes. There won't be enough of it to count. If there is, it will be because you've changed your definition of "direct" to include classes of labor you used to call "indirect."

Continuity of operations is a natural as one factor in measuring the effectiveness of maintenance, materials handling, production planning, and other service departments.

Percentage of machine utilization, in part, measures the effectiveness of production planning, inventory control, and plant engineering.

Both of these measures will be exploited more heavily as it becomes increasingly important to get more accurate measures of the direct contribution of so-called "staff" functions to the over-all goal of the plant—output.

Individual output standards for automatic machines will be no less important in the future than they are now. They are invaluable as an aid to control of unit costs. Where machines are automatic, operator performance will not enter the picture, as it does now. That will tend to make the job simpler, less confused by the introduction of human variability.

The general trend right now is toward extension of standard costs and budgetary control. Emphasis in the future will be on increasingly accurate standards, much faster reporting, and lower clerical costs—via mechanization of clerical procedures.

Today:

Examine your present standards. Revise them as you think necessary in view of your mechanization prospects in, say, 10 years. Then you're more likely to be on the beam two or five years from now.

13. You'll find production and inventory control tougher.

Here's where precision, applied to management processes, can be money in the bank. And lack of precision can lead to disaster. As the production planning superintendent of one brand-new ultra-modern plant puts it:

• **"The need for better production planning and control grows in direct proportion to plant productivity.** New, fast, high-production machines cost more to buy, cost more per hour to operate—and to delay. So you've got to be really on the ball to keep materials moving, machines loaded.

"Also, all the other factors—customer service, economic grouping and timing of orders, personnel relations, and control of inventories and available material—must be calculated. Production planning is going to be—in fact, *is*—an act of fast juggling of cost and human relations factors."

Economic control of inventories will be an equally complex problem. It won't be a matter of keeping inventories down, any more than it is today. The cost of carrying inventories will have to be balanced against the cost of production delays. And in long, integrated, automatic operations (like transfer machines) even the cost of in-process inventory is an important factor.

How important? "We're assigning some of the best talent we have to inventory control," replies our friend in the brand-new plant.

And how will production and inventory control be better in the plant of the future? Primarily by keeping pace with process mechanization, is the consensus of the men who know best today.

The ultimate, of course, is to do the whole job completely automatically. Then automatic recording at every stage of production would feed in-

formation into computers that would spit out the answers almost instantaneously.

To date, operating executives feel the demands of the factory of the immediately forseeable future won't require such "whole-hog" automaticity. High-speed communications will be the answer, they feel, on the level of automatic recorders for key locations, radio, teletype, and, eventually, television. These, coupled with much less paperwork and delegation of key decisions-making authority farther down the line will more than hold their own with advances in production. The decision-making will still be done by people, not computers.

Today:

You needn't wait for further technological advances to streamline production and inventory control. Installation of recorders at key points is entirely practical at the moment, as is improvement in speed of control by means of radio, teletype, or even television. Why wait?

14. You'll use more incentives.

Trouble is you'll have to scratch to find the *right* kinds of incentives in the factory of the future. That's because the development of automatic equipment and processes is already aggravating a problem that has long been with us: *What to do about "indirect" labor?*

Visualize how much tougher this problem is going to be in the mechanized plant where there is a small scattering of what we now call "direct" labor—the machine operators. In contrast the plant has proportionately many more maintenance and service personnel.

What's the operator's "output"—if he and one other man are tending a transfer machine with 15 or 20 work stations—and if his mental alertness is what he's really paid for, rather than his skill? Where do the maintenance men come in? *They* really keep the transfer machine running.

As a result, several things will happen:

• **Use of "pre-determined time standard" systems is sure to grow in the factory of the future**—systems like Methods Time Measurement, Work Factor, etc. They'll help get by the bugaboo of judging "pace." They'll also speed up application of time values, and give more data for use in developing methods and designing equipment.

• **In a profit-minded economy, money is a natural and strong inducement to higher output.** That won't change in the factory of the future. But, as operations get more automatic, there will be less interest in trying to relate incentive earnings to individual effort. Over-all results will be more important. You see it today, too. Jones & Laughlin Steel Corporation recently abandoned the "fair day's work" incentive plan of the steel industry, went back to equipment utilization (output) as the basis for measuring performance and earnings.

• **You will find more applications of incentive plans based on quality of output, material utilization, and even maintenance time and cost.** Plants today are working hard on possibilities of using such approaches.

• **There will also be many more financial incentives for supervisors.** Some companies have them now, think they're good. Others are working actively on the problem, building up valuable experience for use in the future.

Supervisory incentives will be especially important as these men become more "active"—instead of "social"—members of the management team. That will remove the strain of limiting performance factors to items that supervisors clearly control. Reason: The trend will reverse current thinking in some quarters, will lead to *broader* responsibility for supervisors.

Today:

You have one big area to work in right away—work measurement and incentives for what we now call "indirect" labor groups. It's a hard job. But it has been done often enough to prove it *can* be done. That's true of supervisory incentives, too.

15. You'll find plant engineering and maintenance bigger.

They will be more costly, too. But worth it. Here's why:

• **"Increased automaticity of operation in our plant is tending to build maintenance up terrifically—and to demand greater efficiency of us.** When a piece of equipment doing the work of 30 to 50 machines (and probably almost as many men) goes on the blink, the heat's really on. You just can't afford to be down much, or long, with that kind of equipment."

Here's another comment, equally typical, about preventive maintenance:

• **"We've been talking about preventive maintenance for years. Some of us have been doing a pretty good job, too, I think. But we're going to do a lot more for the plant of the future.** Just multiply everything you've been doing several times, and you'll be close. At least you will be if you've been doing a pretty good job."

Today:

How will you get these results? Mainly by:

1. **Better supervision:** That's you, Mr. Plant Engineer.
2. **Better organization, faster communications:** With your help, Mr. Plant Manager.
3. **Better skills:** With your help, Mr. Personnel Manager.

This three-way listing is an over-simplification, of course. But it does highlight a point that's increasingly important in the thinking of operating men in technologically advanced industries:

The "new breed" of plant engineer called for by the factory of the future is going to be a far bigger and more important executive than he's normally recognized to be today. What's more, he's going to have to *be* one—or be replaced.

16. You'll need facilities designed for better maintenance.

You won't be able to afford poor engineering of tools, equipment, and processes in the plant of the future. At best, automatic production will be hard to maintain. At worst, poorly engineered facilities can be almost impossible to maintain. And *that* begins to cost big money when high production equipment is involved.

In the future, more than now, maintenance engineers will work directly with equipment designers and builders. What can be done will be limited only by the nature of the equipment and the ingenuity and cooperativeness of those involved.

Today:

Some examples point the way:

- **For electronic gear, "unitized" control panels permit substitutions of complete electronic components.** This lets equipment get back to work in jig time, gives maintenance men a chance to do repairs when convenient under good conditions.
- **Trouble shooting boards also aid electrical maintenance by showing up locations of defects on lighted panels.** One plant carries the idea further, sets up a complete circuit diagram in miniature for big machines. The circuit actually functions, so trouble can be shot "in miniature" out in the open. Definitely speeds maintenance and cuts downtime, the company says.
- **Accessibility of mechanical equipment is eased by "unitizing," too.** Almost anything can be handled that way. Hydraulic pumps, for example, can be rolled in and out of a machine in a minute or two, if the design is right.
- **At least one big automatic tool builder (transfer machines) is changing head design in the interests of better maintenance.** The old idea was to get tool heads to do as many jobs as possible. Heads often worked one, two, or three stations The new idea is to have each head limited to one station and all tools well separated from one another. The only reason: *maintenance*. New idea makes tool changing and repairs simpler. It permits greater structural rigidity and larger, longer-wearing gears. It costs a lot more to build machines this way, but simpler maintenance makes it pay.

17. You'll find standardization a key concept in your plant of the future.

You won't be alone in this. Everybody's going to be on the standardization bandwagon. It's what many managements have been hoping for for years. It's on the way now with the current Joint Industry Council ("JIC") standardization program.

JIC standards provide detailed specifications for the application of electrical, pneumatic, and hydraulic devices to machine tools and other industrial equipment such as furnaces, presses, welders, and materials handling devices. JIC has also been extended to cover tool steel classification, carbide tools, shot peening, welding transformers, and many other items.

Users of JIC profit in many ways. They don't have to detail every last item to get standardization of installation and devices. They're assured that new equipment will be designed with maintenance and operating simplicity in mind.

The builder of the tools gets a break, too. He now has a good idea of what his customers want and how they want it built. And he'll get fewer complaints from customers.

At present, JIC is mainly an auto industry project, in conjunction with the machine tool builders, electrical manufacturers, and others.

It's the first large-scale step toward the kind of standardization you're going to have to lean on heavily in the factory of the future. If it works in such a highly competitive industry as the automobile industry, it should work anywhere.

Today:

Set up your own internal standardization program. You don't need much outside help to do this. It's a fine first step toward better utilization of automatic and semi-automatic equipment.

You can standardize to advantage on numerous types, sizes, characteristics, and operating locations of equipment. Cylinder sizes limited to just two or three, for example, or restrictions on variety and type of portable power tools, or specifications as to location of switches, boxes, controls, etc.

18. You'll be facing short labor supplies and higher labor costs.

As a result, you will have ample incentive to mechanize your operations more and more. Nothing in the reasonably foreseeable future promises to change this situation. Heavy, continuing, upward pressure on wages will be a major reason for technological gains.

Sometimes even uneconomic changes are forced by the nature of the labor supply. For example:

- **A small plant reports it has had two men break-**

ing up slabs of material with a sledge hammer and carting the pieces in a wheelbarrow. The process engineer has been burning midnight oil trying to devise an economical automatic set-up to do this dirty, unpleasant job. To date nothing has been devised that would justify the cost. Now, one of the men has quit. Nobody will take the job. So plans are being made to put in automatic equipment—even though it will take too many years to pay for itself.

Today:

There are innumerable opportunities in every plant to ease the double burden of limited labor supply and high labor cost. Most such opportunities, fortunately, aren't like the example just cited. They offer definite savings, usually over surprisingly short periods of time. Work on enough of these, hard enough, today, and you find you're *making* the plant of the future.

Need help? Why not consider continuing what's already a trend today — "farming out" your tough problems to consultants. Many have staffs equipped to handle all phases of plant problems—technical as well as managerial.

It's easy to get consulting help. There are many such organizations today. And there will be more tomorrow. Just don't brush off their representatives when they come to see you. Let them tell you about themselves and what they can do.

Don't overlook the universities, either. Many do fine basic and applied research that may help you.

19. You'll have union trouble.

Looking for a labor relations "millennium" in the plant of the future? Don't. You'll still have unions, and you'll still have your troubles. Because your employees will be generally of higher educational and skill levels, troubles will probably not be as tough. But they'll still be there.

There's good reason to believe that most of your problems won't arise out of "going automatic." That's because the days of successful union opposition to technological progress are, with one major exception, past.

• John L. Lewis, the "old ogre" of the coal mining industry, is a good example of current attitudes. He has consistently gone along with the trend toward automatic mining. He has exacted his toll, of course — but on the traditional issues of collective bargaining, not on the issue of automaticity.

• And here's what Philip Murray, president of CIO, has to say:

"I do not know of a single, solitary instance where a great technological gain has taken place in the United States of America that it has actually thrown people out of work. I do not know of it, I am not aware of it, because the industrial revolution that has taken place in the United States in the course of the past 25 years has brought into the employment field an additional twenty million people. . . The CIO as an important segment of the national population is always going to be for technological change."

Sounds good? It *is* good—but by no means perfect. Two reasons why it isn't:

• You haven't heard from AFL on technological progress. The deplorable history of many AFL craft unions' opposition to technological gains is an old story. It gets no better in the re-telling. Oddly, such opposition tends to backfire. High labor costs and low output per man-hour among craft unions set the ideal economic stage for technological improvements.

You can be sure of one thing: As economic pressures get even greater in the society of the future, craft union opposition to technological progress will be beaten down.

• You haven't yet hit the big problem of the plant of the future — the problem of preserving basic maintenance craft skills while at the same time having flexibility to cross over craft lines in plant work. Because maintenance is steadily getting more important, the problem has many plants over the barrel.

• One plant engineer in a highly mechanized company reports:

"The ideal for us would be to have *combined* maintenance skills — electricians, for example, who can do hydraulics repairs, too. But the union won't let us."

• Another plant engineer says:

"The basic background required is electrical. But our men should be able to do millwright work and pipe fitting, too. As it is, the three crafts hang around and get in one another's way on many jobs. We have one new plant that's not unionized yet. We have just the "general maintenance man" job we need there. We like it. Most of the men like it. But we're going to have a rough time when the union finally gets in and sees what we've done."

CIO's record is hardly better than AFL's when it comes to restrictions on crossing over craft lines in plants. The old-time craft-conscious journeymen keep the issue hot.

Today:

Feeling hopeless over this one? If so, you're not alone. Many managements have nearly given up. But that's not the answer. It never has been.

As time goes on, there will be less and less danger that maintenance men — of all plant workers — will ever work themselves out of a job. The problem is, and will be, to find *enough* of them. That blasts the biggest argument workers have had for rigid craft lines in a plant.

Maybe it won't convince the union the first or second time around. But you ought to keep pitching on this one. You *must* have maintenance flexibilty in that factory of the future.

New application for an old material . . .

Aluminum body for Buick's "dream" convertible holds total weight of full-size, 300-hp. car down to 3125 pounds. Buick says its XP-300 is a "laboratory on wheels . . . about the only thing standard on it are nuts and bolts." It will not be made commercially.

. . . and a new material

Layers of glass fiber polyester plastic make a body that weighs only 185 pounds for small (100-in. wheelbase) car. Glasspar Company is making the non-rusting bodies in low-pressure molds, says they spring back into shape after impacts that would dent normal fenders.

TODAY'S
NEW PRODUCT MATERIALS
Are Ready for the Factory of the Future

By the Staff of PRODUCT ENGINEERING, a McGraw-Hill Publication

PLASTICS

RUBBER-PLASTICS BLENDS

Natural rubber is a relatively soft material, unless it has been heavily reinforced with minerals or other pigments, or unless it has been fully "cross-linked" as it is in hard rubber. There is no continuous gradation of hardness in rubber itself. On the other hand, the synthetic resins—styrene, phenolics, vinyl chloride—usually in themselves are hard, and are made soft and flexible only by the addition of plasticizers.

It is now possible to tailor the softer ingredient and the harder ingredient to each other so that they are mutually compatible. As a result we have a whole series of relatively new plastics which are rigid or semi-rigid or flexible, of extreme toughness, yet easily formed into products.

THERMOPLASTIC-ELASTOMERIC BLENDS · The first group, the thermoplastics, seem capable of almost infinite variation in properties and form. It is produced as two series of materials: (a) a compound for injection and extrusion molding of machine parts and such products as electrical terminal blocks, dials, telephones receivers and bases, plugs, switches, and a wide variety of extruded parts; and (b) as sheets, which can be formed in compression presses into housings, battery cases, television masks, typewriter cases, and similar parts.

These materials are outstanding in their ability to be both hard and tough at the same time. In addition they are chemically resistant and are used in industrial equipment requiring simultaneous maximization of these properties. Such products are cathode edge strips, chemical pipe, textile end caps, quills, and bobbins. Small mechanical items such as cams and gears are ideal applications.

Another form of these plastic-elastomeric blends is "tailored" specifically to be made into rigid pipe characterized by very high impact strength, for use in handling many corrosive industrial chemicals. It can be threaded with standard hand or machine tools. It can be bent by heating to 180–185 F in a water bath or hot air oven.

The sheet-forming modification appears quite promising for relatively large structural applications. Standard grain finishes and a smooth glossy finish can be applied. This material can be formed into intricate shapes with relatively light and inexpensive equipment, using wood, Masonite, aluminum, or Kirksite molds.

Sheets and shapes can be machined with ordinary wood- and metal-working equipment. They can be sawed, sheared, drilled, punched, riveted, sanded, cemented, and polished.

(Based on information and data furnished by United States Rubber Company.)

THERMOSETTING PLASTIC-RUBBER MATERIALS · Developed to bridge the gap between soft rubber and hard rubbers, a series of phenolic resin-nitrile rubber mixtures will fulfill the need for high-impact materials that are resistant to abrasion and chemicals. They can be produced in varying degrees of flexibility. They are available as a molding compound, and as sheets, rods, tubes, and gear blanks.

One of the outstanding uses is for manufacture of high-strength, low-cost gears to replace metal gears in such applications as heavy-duty lathes, household appliances, plating barrels, automotive timing devices, and dynamometers. Gears made of the new plastic have been operating for more than a year in applications where conventional metal gears have failed within a few weeks. These gears were molded in one piece to very close tolerances, eliminating the need for elaborate finishing operations.

The material is also suited for washing machine parts where its resistance to the newer type of synthetic detergents has given it an advantage over metal. Other promising applications include fuel pump parts, battery cases, valve seats, plating barrels, bearings, electrical insulators, and various automotive parts.

These materials are light in weight and extremely stable at high temperatures. They have good resistance to fire; their high dielectric strength makes them good electrical insulators. Impact strength is superior to most plastics now available and they can be molded economically by either compression or transfer methods.

Turn the page

LARGE MOLDED PARTS

Improvements in properties of thermoplastics, especially styrene plastics, have led to molding of parts with increasingly large projected areas. This trend will continue with improvement of dimensional stability in the presence of heat, moisture, and loads, as well as "zero stress" dimensional stability.

Experiments are being made with short glass fibers which can be injection molded as a reinforcement with styrene plastics. If this is successful, molding of large flat areas is planned; an example is a refrigerator inner door panel, now made of thermosetting plastic laminates.

(Based on information supplied by Plastics Division, Monsanto Chemical Company.)

REINFORCED PLASTICS

This is perhaps the most significant field in plastics as far as future developments are concerned. Two specific developments worth watching are (1) plastic-fibrous glass gear covers having only a fraction of the weight of steel, with greatly reduced sound and vibration transmission; and (2) plastic-fibrous glass pipe, with phenomenally high bursting strength. Cost of materials is higher than ferrous metals. But greatly reduced weight and increased resistance to corrosion will offset this factor.

NYLON

This is rapidly becoming the preferred material in certain types of machines, where little or no lubrication is available—textile machinery, kitchen appliances, calculating machines. For small gears, too, it is replacing metals.

EXTHOXYLINE RESINS

These resins are a new generic series, formed by chemical "condensation" of polyarylethylene oxide compounds with acid anhydrides, amines, and other compounds. Like the polyesters, they form thermosetting compounds without evolution of water or volatiles. They are produced in three basic commercial forms: bonding resins, casting resins and surface coating resins. The bonding resins require only low pressure, and are effective with glass, ceramics, and metals.

FLUORINE PLASTICS

Two polymers in this group have firmly established themselves as seal packing, and insulation materials of outstanding resistance to corrosive chemicals, temperature extremes, and electrical forces. These materials, polymers of tetrafluoroethylene and monochlortrifluoroethylene, are marketed under the tradenames of Teflon (DuPont) and Kel-F (M. W. Kellogg Company).

CELLULOSIC PLASTICS

Ethyl cellulose has a good future because of the increasing toughness that will be required of thermoplastics, over a wide temperature range. Its impact strength is greater than that of any other thermoplastic material, with the possible exception of the new plastic-rubber blends. Textile bobbins and flashlight housing are typical product applications.

FOAMED PLASTICS

LIGHTWEIGHT STRUCTURAL MATERIALS • Primarily for aircraft applications at present. In sandwich construction, the foamed plastic core separates and supports the facings to give the panel sufficient thickness and stiffness. Foamed plastics stabilize hollow steel propeller blades.

THERMAL INSULATION • In France, an entire radio station has been lined with foam plastic panels for both insulative and acoustical purposes.

SHOCK ABSORPTION, CUSHIONING, AND GASKETING • They're being used for protective packaging, padding, engine or equipment mounts, and such comfort rendering material as seat cushions, arm rests, mattresses. As gasketing in refrigeration equipment, they contribute insulation as well as shock absorption.

ELECTRICAL AND ELECTRONIC APPLICATIONS • As embedments for components, foamed plastics protect against shock, moisture, dirt, and fungus.

Foamed materials in use today or in an advanced stage of development include the vinyls, phenolics, phenolic-rubber blends, polystyrene, styrene-butadine blends, cellulose acetate, alkyd-isocyanate, hard and soft rubber compounds.

Foamed-in-place resins can be expected to find

application in lightweight panel construction, such as refrigerator doors and cabinets, table tops, housings for electrical and mechanical equipment.

ADHESIVES

100% SOLIDS · Among the most recent developments are the epoxy or ethozylene resins. These resins are 100% solids that shrink only slightly on curing. The properties of minimum shrinkage, low temperature cure, good adhesion, and low pressures needed for cure make these resins ideal for some purposes. They bond to a wide variety of both porous and non-porous materials and need very little pressure and heating equipment.

Another class of 100% solids adhesives is the furane resins. These are especially noted for their adhesion to thermosetting plastic materials. They can be properly cured either at room or elevated temperatures.

The number of resins used in high-strength glass-cloth laminates is constantly increasing. These include the epoxy resin, allyl glycol esters, unsaturated polyesters, silicones, and nylon. Each of these resins imparts different properties to the laminates. Their choice depends on whether the user is interested in heat resistance, electrical strength, or other properties.

Rivets are being replaced more and more by phenolic elastomer adhesives in bonding linings into brakeshoes. These same adhesives are also used extensively in airplane construction. One-third of the surface of the B-36 is reinforced with members held by adhesives. Some of the advantages of this type of construction are that smoother, strain-free joints exhibiting high strength and good corrosion resistance can be obtained.

Silicone adhesives for bonding silicone and other types of rubber to non-porous materials are also under development. Chemically they are the most heat-resistant adhesives, but they are low-modulus resins that cannot be used where high-strength bonds are required.

DRY-FILM ADHESIVES · Through the use of a 0.002-in. dry film of adhesive, where thickness can be accurately controlled, uniform thickness of a bonded area can be assured. No time is required for solvent evaporation. And sheets can be cut to desired shapes, thus facilitating automatic machine assembly of different metallic and non-metallic combinations into laminated structures.

These dry adhesives are becoming more widely used in metal assemblies, and for bonding dissimilar materials in electrical and electronic applications. Two steel plates formerly ground and then drilled and tapped for 13 machine screws are now pressed together with the film between, then induction heated to a complete cure in 2 minutes.

METALS

Future developments will produce metals and alloys with higher strengths and better resistance to creep, fatigue, oxidation, and corrosion. Improvements are expected in stainless and alloy steels, in the lightweight metals, aluminum and magnesium and their alloys, in currently available "super alloys," and in protective coatings for high-temperature service and corrosion resistance.

ALLOY STEELS

The trend in steel is definitely toward increasing use of the alloys, as opposed to the plain carbons. This is partly a result of realization of the significance and importance of the hardenability concept, which came during the war.

A parallel trend is the seeking of greater strength-weight ratios and corrosion resistance than possible in plain carbon steels. The answer has come: low alloy steels which give decidedly improved properties over common structural steels, especially in increased yield point.

A new series of low-carbon, low "multiple" alloy steels has just been developed, with even higher strength levels than earlier low-alloy types.

In response to the demand for steels of even higher strength, new materials with larger percentages of alloying elements, but still in the "low" (less than 5%) range, are being developed. These are marketed in an untreated condition. High strength properties are obtained by heat treating after machining. *(Based on information supplied by United States Steel Corporation and Crucible Steel Company of America.)*

ALUMINUM

Increased use of aluminum - alloy die casting is a definite trend. For the future, high-strength aluminum-alloy sheet materials are a definite need. A formable sheet material of over 100,000 psi. tensile, with a high yield strength, could be used in both aircraft and ground vehicles.

MAGNESIUM-BASE ALLOYS

Studies in the laboratory and on plant equipment have led to the selection of Mg-6Ag-6Zn-1Zr alloy, as the composition showing the most immediate promise for commercial development as high-strength sheet. These tests have demonstrated its comparatively good extrudability and rollability. Sheet has been produced in a variety of gages, both clad and non-clad. Maximum properties are obtained by solution heat treating and

aging hot rolled sheets. High-strength combinations with good hot formability are characteristic of this composition.

Based on developments at the Engineer Research & Development Laboratories (Army), Fort Belvoir, Va.

TITANIUM

Because its strength is equivalent to annealed stainless steel and its density is only 57% of it, titanium is being evaluated as a structural material for aircraft.

Engineers involved in titanium development feel that it will be possible to substitute titanium for stainless steel, thickness for thickness, with a 40% weight saving. Portions of aircraft immediately surrounding jet engines will be particularly improved through use of titanium.

Outside of the aircraft field, titanium will be used in design of equipment exposed to marine and corrosive atmospheres, because of its outstanding resistance to chemical attack. Possibility of its use in land vehicles is indicated by a new application developed by Army Ordnance. This is a mortar base plate. In steel it weighed 48 pounds and was in two parts. The titanium plate weighs only 24 pounds and is designed in one part.

Potential uses for titanium where light weight and resistance to high temperature and corrosion are required, include springs, gears, portable machine tools, machine parts for the textile industry, pump rods or rotor shafts under packing materials where stainless steel often pits, and where weight is a consideration in the operation of mobile equipment—to fill the gap between properties of aluminum and ferrous alloys.

LESS COMMON METALS

ZIRCONIUM · The corrosion resistance of this metal is excellent, but it lacks the advantage of titanium's low specific gravity. Its excellent resistance to alkalis and certain acids may lead, in chemical industries, to replacement of platinum, tantalum, and other expensive metals.

The cost of ductile zirconium remains too high for widespread use. However, the advances in production methods are continuing. The strength of the rolled or swaged metal is similar to that of the copper-base alloys. The drawn metal has a tensile strength in the range of that of annealed medium-carbon steel. The strength-weight ratio of zirconium is below that of magnesium, titanium, or the strong aluminum alloys.

MOLYBDENUM · Because of its high melting point, molybdenum shows promise of becoming one of the basic materials for high-temperature structural applications. With the development of the arc-casting method, it is now possible to obtain ductile molybdenum in sections weighing as much as 150 pounds, while equipment under construction will make it possible to increase this to 1000 pounds. Indicated applications are for 2000-3000 F temperatures, far beyond the range of stainless steel and other nickel-chromium alloys, including such applications as gas and oil burner nozzles and jets, heating elements for electric furnaces, combustion chambers of gas turbine engines, and jet engine parts.

For the future, molybdenum will probably have the same relationship to the high-temperature field that titanium will have to the lightweight structural field.

TANTALUM · Alloys with columbium and molybdenum are resistant to a wide variety of mineral acids, even at moderately elevated temperatures. It is a fairly safe prediction that these tantalum alloys are going to find wide application in the chemical industries.

CHROMIUM AND VANADIUM · For the not-too-distant future, these two metals bear watching. If they can be produced in ductile form at moderate cost, indicated applications are for 1000-2000 F temperatures, where corrosion-resistance is a factor.

POWDERED METALS

With the perfection of a technique for infiltrating iron powder from copper alloy, it is now possible to mass-produce jet engine blades having a yield strength of 90,000 psi. These pressings are able to withstand three to four times as much vibration a 403 stainless and eight times as much as carbon steel blades.

Precision parts weighing 5 pounds and measuring 18 inches in diameter can now be made. Thus the advantages of little or no machining, minimum scrap, and comparatively low-cost production equipment may well be capitalized through the redesign of certain parts now being forged or machined.

Iron powder similar to Swedish sponge iron is now in pilot production. This material, which approaches the purity of electrolytic iron powders, eases compacting because of its structure.

In the event of a pronounced swing to powder metallurgy as the result of materials and production equipment shortages, it is possible that this process will be the answer for materials having satisfactory strength and corrosion resistance at extremely high temperatures.

NEW CERAMICS

HIGH-TEMPERATURE COATINGS

The increased demands for power in jet, rocket, and internal - combustion engines have called for operation at higher temperatures. Metals for such installations must have not only the toughness and strength but also the high melting point necessary. Unfortunately, the metals available in the requisite quantities, notably molybdenum, are highly susceptible at operating temperatures to oxidation and other forms of corrosion.

The answer has come in metal-ceramic combinations. For jet and gas turbine use, two different approaches are being attempted.

1. The National Bureau of Standards coating is a metal-ceramic combination applied as follows: During heating to cement the coating to the base metal, powder incorporated in the mixture is welded by diffusion to the base metal, providing a firm and very adherent intermediate layer. An all-ceramic outer layer provides additional protection.

2. Certain armed forces branches are utilizing the "ceramets," which are a premixed combination of metals such as chromium with a "ceramic" portion such as aluminum oxide. These have better thermal shock resistance and ductility than ceramics; some mixtures can be machined. They have a lower melting point than ceramics, but are still in the high-temperature range.

PORCELAIN ENAMEL COATINGS FOR STEEL · A new type of ceramic coating for the protection of mild steels in high-temperature service has been developed at the National Bureau of Standards. Laboratory and service tests have shown these new coatings to be superior to conventional porcelain enamels for high-temperature service. The outstanding features of the coatings are: (a) high resistance to chipping under repeated severe thermal shock, (b) protection of the metal against oxidation during prolonged exposure in air at temperatures up to about 1250 F, (c) freedom from the cracking and blistering produced in conventional porcelain enamels under comparable conditions of high temperatures and several thermal gradients; and (d) a matte surface that does not show highlights and, therefore, decreases the visibility.

In addition to the use of the new coatings for the protection of low-carbon steel in various military exhaust systems, there are a number of other possible applications where the new coatings, or modifications of them, might be beneficial in prolonging the life of steel parts that are subjected to relatively severe temperature conditions. A list of such potential applications would include (1) domestic stove parts, such as grates or burners; (2) industrial furnace parts, such as mufflers, dampers, or burners; (3) parts for heat interchangers; (4) heat baffles for continuous enameling furnaces; (5) annealing boxes; and (6) mufflers and tail pipes for buses, trucks, and automobiles.

NEW CERAMIC DIELECTRICS

SYNTHETIC MICA · This development promises to be of widespread importance. It is made by sintering or hot pressing from relatively inexpensive chemical raw materials.

Principal application will be as dielectric parts in high-frequency communications and high-voltage equipment. Its dielectric properties compare favorably with glass-bonded natural mica (Mycalex). And potential cost is much lower. Another possible application is as a heat insulator.

It can be sawed, drilled, turned on a lathe, and cut with ordinary metal-working tools to close tolerances with relative ease. Right now shapes are machined from semi-finished forms such as bars. However, pressed sheet suitable for stamping operations is expected to be developed at an early date.

ORGANIC FINISHES

SILICONE FINISHES · Outstanding heat stability, excellent weather and chemical resistance, color and gloss retention above 400 F and low temperature flexibility are characteristic of silicone resins. Enamels based on these, particularly those pigmented with aluminum powder, have found wide application for stacks, boilers, furnaces, incinerators, steam lines, exhaust systems, heat exchangers, arc light reflectors, and the like. Other colored enamels have gone into resistor coatings, identification markings for welding rods and electronic tubes. On the debit side, however, are these inherent weaknesses: low solvent resistance, thermo-plasticity, poor adhesion to steel, incompatibility with most organic film formers, and the high temperature needed for curving.

New modifications, however, promise to overcome these difficulties.

NEW VINYL COATINGS · Another outstanding trend in the organic coating field is the use of specialty coatings for resistance to corrosive chemicals and physical abuse in industrial applications. Specifications for such coatings include economy and ease of application — usually by spraying or dipping, directly on the degreased metal surface.

The vinyl-base coatings seem to hold the answer to this group of requirements. Metallic powders, such as stainless steel, zinc, and aluminum, are easily incorporated, where increased corrosion resistance is desired.

The Atom Is Now Helping

By T. KEITH GLENNAN
Member, Atomic Energy Commission

What's ahead in the atom business for American industry? The great promise the stored energy of the atom offers is now directed along three broad avenues:

1 · RADIOACTIVE ISOTOPES

Virtually unknown to industry only a few years ago, isotopes are now being used by some 300 companies and institutions in a rapidly expanding variety of research projects and process operations.

Radioisotopes are useful in two ways —as tracers and as radiation sources. The tracer atom technique is probably the most sensitive investigational method yet devised. When you use radioactive carbon 14 as a tracer, the technique is a million times more sensitive than ordinary chemical and spectroscopic analysis. A minute quantity of a radio-isotope, behaving chemically like the stable atoms of the same element, can be used to trace the course of ordinary atoms through complex processes, untangling reactions and reaction mechanisms that can be followed in no other way.

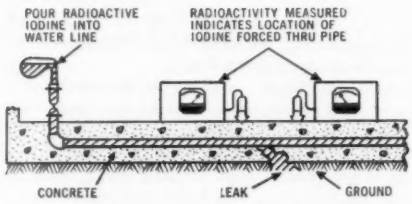
Isotope dilution techniques are being used to determine efficiency of extraction and precipitation procedures, purity of compounds, solubility and surface area coefficients, and to identify decomposition products.

Studies of physical and physical-chemical transfer make it possible to measure self-diffusion of metals, wear of machine parts, and such phenomena as adsorption and absorption, surface wetting, solubility, and ion exchange—important to an understanding of detergency, flotation, metallurgical reactions, and other industrial processes.

Radioisotopes are also being used to study the mechanism of such reactions as oxidation and isomeration of hydrocarbons, polymerization and vulcanization of rubber, and dehydrogenation and aromatization of petroleum. [*Don't let the Commissioner's sextisyllabics throw you. There just wasn't any other quick way to say it. You'll find smooth going from here on. —The Editors.*]

Used as radiation sources (similar to

EXAMPLE NO. 1



RADIOACTIVE IODINE SPOTS LEAKS IN BURIED PIPE

To find leaks in pipelines under concrete floors, Radioactive Products, Inc., Detroit, uses radioactive iodine. A small amount of the "hot" iodine is run through the pipe. Some spills out the leak. At that point a survey meter will detect an increase in radioactivity even through a heavy layer of concrete. That means you can pinpoint your digging instead of tearing up the entire floor.

In much the same way Detroit Edison Company has used carbon monoxide gas labeled with carbon 14 to find leaks in its underground gaslines.

EXAMPLE NO. 2

GAMMA RAYS TEST WELDS

Linde Air Products Company uses gamma rays from cobalt 60 to make radiographs of welds. Formerly the company used radon gas, a decomposed product of radium. The gas was usable for only 3½ days, as against a useful life of 5.3 years for cobalt 60. And the equipment now used is more portable and a lot more flexible than X-ray equipment.

How It Works · You place a piece of film behind the weld, allow rays from the radioactive cobalt to penetrate the weld, expose the film. Then you strip off the film, develop it, and inspect for flaws.

Shape the Factory of the Future

the uses for radium and X-rays), isotopes are performing with increasing promise in radiographic testing, thickness gages, liquid-level gages, density meters, and in measuring liquid flow.

Dozens of practical applications can be cited to illustrate the general purposes already outlined. Yet the comparative value of the isotope technique must still be measured for its usefulness in specific problems. However, even the smallest companies can find out for themselves—by hiring consultants, initiating their work in commercial laboratory facilities, or by investing from $5000 to $12,000 to convert standard laboratory facilities for safe investigation of problems utilizing radioisotopes.

2 · FISSION-PRODUCT RADIATION

How fast is industry moving toward a more radioactive future? To answer this question, our look ahead automatically takes in the second broad avenue of industrial interest—fission-product radiation, in large amounts at low cost.

Survey findings reported by the Stanford Research Institute last year provide the best clue here, even though the techno-economic study for AEC is but a preliminary attempt to forecast what's ahead. The broad finding was that a potential large-scale demand for fission products exists in industry. But many technical and economic problems must be solved first.

Promising industrial applications for fission products are to be found in various stages of technological development, according to the report. The Stanford study lists among present commercially feasible use for radioactive waste fission products: the activation of phosphors for self-luminescent signs and markers; static eliminators for a variety of industrial processes; the reduction of starting voltage requirements in fluorescent light tubes and in process control instruments that incorporate a source of radiation. Under possible future uses, provided the technology can be developed, are listed industrial radiography, cold steri-

Turn the page

EXAMPLE NO. 3

Piston ring is made radioactive . . .

. . . operated in a test engine . . .

. . . engine oil is tested by Geiger counter

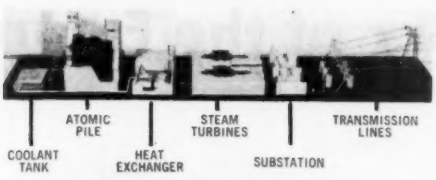
THREE WAYS ISOTYPES ARE USED AS TRACERS

1. To test engine wear. Ford Motor Company uses a radioactive piston ring in an ordinary engine. After a few hours of operation, a sample of oil is taken from the engine crankcase. A Geiger counter immediately indicates the amount of metal worn from the ring.

2. To test for pollution. One company added an isotope to its waste, then dumped it in a stream as usual. By checking a sample of the water with a Geiger counter, the company was able to prove that it was not contaminating the stream. No radioactivity meant no pollution.

3. To detect traces of soil. Where superclean surfaces are required in metal cleaning, Monsanto Chemical Company "soils" the surface to be tested with a radioactive oil, then cleanses with a detergent. Geiger counter will then measure radioactivity—and soil—remaining after cleaning.

EXAMPLE NO. 4



PRODUCING USEFUL ELECTRICITY

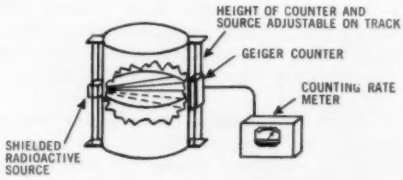
Here's a model of a reactor power plant such as the Atomic Energy Commission used to produce the first useful electricity from atomic energy. A turbine operated on steam generated by coolant from reactor. It powered a generator producing 100 kw. for operating pumps, also provided electric power for the building that housed the reactor.

EXAMPLE NO. 5

IDENTIFYING PRODUCTS IN PIPELINES

Standard Oil Company of California injects a radioisotope into the line each time a different liquid is added. Then Geiger counters, coupled to recording instruments, detect radioactivity at points along the line. From the recorder an operator can both identify interfaces as they pass and keep the products properly separated for runoff.

EXAMPLE NO. 6



MEASURING HEIGHT OF MOLTEN METAL IN CUPOLA

Ford Motor Company uses gamma rays from radioactive cobalt.

How It Works · Rays pass through cupola, are picked up by Geiger counter. The less metal the rays pass through, the stronger the radiation. So, by varying height of counter and noting radiation, operator can tell where molten level begins.

lization of drug and foods, and portable low-level power sources.

In addition to surveying potential markets, the Stanford study considered the problem of processing, preparing, and shipping fission products to industry, as well as the research and development program needed to encourage industrial use of large quantities of fission products. Moving right along on this phase of the program, AEC personnel recently completed a survey of the activity levels, volumes, and character of the fission product waste at various reactor stations, and are now experimenting on ways to extract the fission products.

The Brookhaven National Laboratory has been established as a central coordinating agency to advise the Commission in the evaluation of research proposals and assist investigators in establishing safe and operable experimentation with high level radioactive sources. This Laboratory offers a special irradiation service to industry, and many organizations are now sending prepackaged product for gamma radiation.

Although radiation from production reactor byproducts is not available even for research as yet, thousand-curie sources of gamma and beta radiation from the research reactor at Brookhaven are now being used in liquid polymer studies at that and other AEC laboratories. Also, AEC is supporting research in gamma radiation application at several universities.

One such program is the study of radiation sterilization of foods and pharmaceuticals at MIT, Columbia, and the University of Michigan. Another at Michigan is proceeding on the theory that ionizing radiations from gross fission products may be used to improve the explosive reactions in internal combustion and jet engines.

3 · ATOMIC POWER

A vast gulf of unexplored technology and unproven economics separates us from practical atomic power. Only the fundamental technical feasibility has been demonstrated. And this was done just last December, when an experimental reactor at AEC's National Reactor Testing Station in Idaho released sufficient heat energy to generate the first electric power from the atom.

Thus we know that the fission process

releases considerable energy from atomic fuels in the form of heat, which can be removed from a reactor in a coolant, such as water, air or a liquid metal. From this point the conversion to electricity requires all the conventional power plant equipment—heat exchangers, turbines, generators, etc.—so the atomic fuel is simply a new source of heat.

Industry may soon know considerably more about the timetable on utilization of this potential energy source. AEC is now reviewing the reports of the eight public utilities and industrial companies that have undertaken to determine the feasibility of private industry's building and operating reactors for the production of fissionable materials and electric power.

AEC's current reactor program comes under close scrutiny, of course, as these power experts judge the prospects for early development of central station atomic power plants.

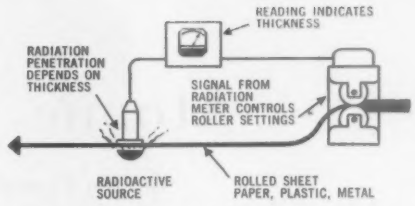
Along with technological progress, the economic possibilities for developing power production from atomic fuels will improve—if more economically recoverable uranium becomes available; if energy quantities obtainable from atomic fuels are increased substantially by the attainment of successful breeding; if a favorable military market for plutonium serves to subsidize the production of power; if radioactive fission wastes turn out to be salable byproducts of reactor-produced power.

But we have set a very difficult mark for any new source of power to meet, because of our natural endowment of large amounts of cheap coal, oil, and natural gas. Particularly where present fuels are very expensive, such as at great distances from fuel sources, however, power from the practically weightless atomic fuels may turn out to be very useful.

We can speculate further, of course, on the remote but challenging possibilities that some day someone may find a way to transfer atomic energy directly into electrical energy without going through the process whereby heat must first be produced and then utilized; or a way to make naturally occurring elements other than uranium and thorium give up the energy stored in their atomic nuclei.

Chances are, *your* plant of tomorrow will, in one way or another, do business with the atom.

EXAMPLE NO. 7


READING INDICATES THICKNESS
RADIATION PENETRATION DEPENDS ON THICKNESS
SIGNAL FROM RADIATION METER CONTROLS ROLLER SETTINGS
RADIOACTIVE SOURCE
ROLLED SHEET PAPER, PLASTIC, METAL

GAGING THICKNESS OF EXTRA-THIN FILMS

Goodyear Tire & Rubber Company uses carbon 14 isotopes to gage 0.001-inch Pliofilm continuously as it comes off the production-line rolls. Mechanical gages formerly used were sometimes inaccurate. Production had to be stopped to take readings.

How It Works · A protected source of radiation is located beneath the sheet of plastic as it comes from between the pressure rollers. A Geiger counter above indicates amount of radioactivity penetrating the sheet. That's a measure of film thickness.

Here's a further refinement. If the number of radiations per second is too low, it means that the sheet is thicker than specified. A control automatically increases the pressure on the rollers. If the count is too high, it automatically relaxes the pressure. This split-second control has resulted in material savings of more than 20%.

EXAMPLE NO. 8

MEASURING METAL-WALL THICKNESS OF CLOSED VESSELS

The Texas Company uses a radioactive material hooked up with a radioactivity detector to indicate thickness. And without drilling holes to admit calipers or using other destructive methods of measurement.

How It Works · First you set up a controlled source of radiation and aim it at the object you want to gage for thickness. Some of the gamma rays given off by the source bounce back from the metal. These rays are picked up by the detector, give an accurate measurement of wall thickness.

In same way, Texas says, you can also spot liquid level in vessels where level gages aren't practical.

To add to your atomic vocabulary, turn the page.

Atomic Glossary

for the Factory of the Future

Atomic fission • This is the chain-reaction process by which heavy, unstable atoms (like uranium-235 or plutonium) split into two smaller atoms. Energy in the form of heat is created in this process. When fission takes place rapidly and on a big scale, you get an atomic explosion.

Reactor • This is a device for controlling fission. The fissionable material is placed inside a pile of graphite, which acts as a "moderator." That is, the graphite slows down the speed at which atomic particles travel. This not only makes it possible to control the process, but actually increases its efficiency. Energy released in the form of heat inside a reactor like the one at Arco, Idaho, has been used to produce steam to power electric generators.

Fission products • These are the wastes left over after fission takes place. Fission products are a potent source of radioactivity for industrial applications.

Radioisotope • An atom can become a source of radioactivity without changing any of its chemical properties. When an element is changed only to the extent that it becomes radioactive, it is called a radioisotope.

Tracer • When a radioisotope is combined with some of the ordinary form of an element, the radioactive atoms become tracers. It is something like banding the legs of birds to follow migrations: The banded birds are not aware they are any different from the rest of the flock, but they can be identified at any point in the migration.

Radioactivity • This is the broad term applied to emissions of either particles or energy as the result of atoms changing their form. These emissions are of three types: alpha, beta, and gamma.

Alpha radiation • Alpha "rays" are really particles of matter: Each contains two neutrons and two protons. In the atomic scale of things, alpha rays are "heavy" radiation. They travel only an inch or so, have little penetrating power. But they are useful for ionizing air (reducing static electricity).

Beta radiation • Beta "rays" are also in the class of particles: A beta ray is a stream of electrons. Beta rays are "light" radiation. They will travel several feet, have considerable penetrating power (but less than X-rays). They can be used for measuring thickness or sterilizing food.

Gamma radiation • Gammas are true rays or waves, but even shorter than X-rays. They have tremendous penetrating power, are useful for making "X-rays" of substances like steel castings and forgings that ordinary X-rays will not penetrate.

Curie • This is a unit of measure of the *intensity* of the radiation available from a given radioactive substance. It is defined as the amount of radioactivity you get from one gram of radium. (The name comes from Marie and Pierre Curie, discoverers of radium.) Reason for the unit is this: When you use radioactive materials, you're not interested in how much material, but in how much radioactivity you are getting.

Roentgen • This is a unit of measure of the *amount* of radiation (rather than intensity, which is amount per unit of time). It provides a convenient yardstick for safety standards. Since the human body can absorb enough radiation to be dangerous, the Atomic Energy Commission has set this standard: Maximum absorption should not exceed 0.3 roentgen per week by the body as a whole. A dose of 5000 roentgen, for example, may be used on a small area to remove a skin cancer. And 0.05 roentgen per day on a 6-day week would be safer than 0.3 roentgen per hour one hour a week.

Geiger counter • This is perhaps the most common type of instrument to detect and measure radioactivity. It makes a clicking sound when in the presence of any radioactive material. The rate at which the clicks occur tells the intensity of the radioactivity from all sources at any given point.

Half-life • This is the length of time it takes any substance to reduce to one-half of its original radioactive potency. This time will vary from millionths of a second to millions of years, depending on the material. "Half-life" is used as a measure because full life is infinite: Successive reductions in radioactive potency are like compound interest working in reverse.

Radiography • This term describes the making of shadow-pictures by directing very short wave radiations at photographic film. The X-ray is a familiar example of radiography. But as the term is used in connection with atomics, it generally refers to "X-rays" made with gamma rays.

Cold sterilization • By properly timing the exposure of food or pharmaceuticals to beta radiations, it is possible to kill bacteria without heating the substance in which they live. (Actually, temperature may rise 5 degrees or so, but not enough to change flavor or medical quality.) Fission products are a good source of the beta radiations needed.

Without going into the fission field, the same results can be produced with a betatron—a sort of super-X-ray machine that accelerates electrons to beta-ray speed by passing them through an electro-magnetic field.

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AUXILIARY EQUIPMENT 134
ELECTRICAL EQUIPMENT ..... STARTS HERE
MAINTENANCE TOOLS & SUPPLIES 140
MATERIALS HANDLING 146
MEASURING & CONTROL 158
PLANT HOUSEKEEPING 164
SAFETY 168
VALVES, PIPING & ACCESSORIES 170
MISCELLANEOUS 172

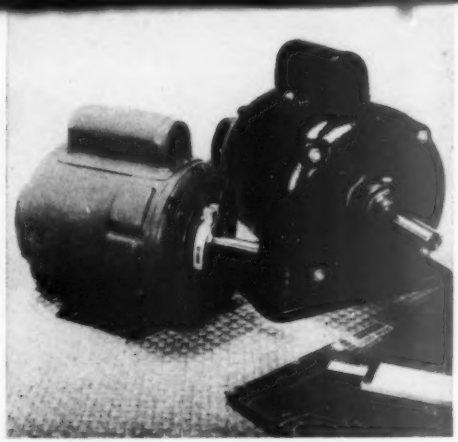
IN THE NEXT ISSUE ..... **Some notes on important late items. More about them next month.**

Packaged Area Illumination for plants is now easily ordered, easily installed. You can fit this new system of fluorescents and diffusers into your ceiling without custom-building it to the job.
Smithcraft Lighting Div., A. L. Smith Iron Co., Chelsea 50, Mass.

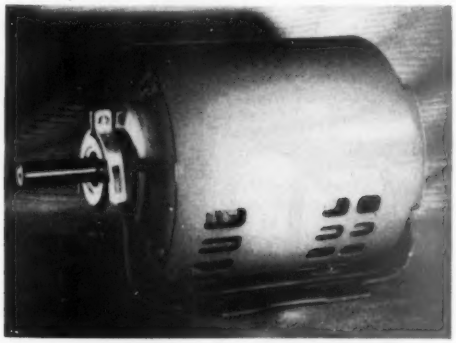
Versatile Vertical Lift can be bolted down and used as an elevating table. Or you can team it with a jack lift and use it as a platform lift truck.
Lange Lift Co., 102 W. Fowler St., Milwaukee 3.

Air-Sealed Selenium Rectifier stands up under corrosive attack, can be used safely alongside or above cleaning or pickling vats.
Wesley Block & Co., Flushing, N. Y.

Complete Fire Extinguishing System comes ready for installation by the customer. You order the piping and accessories you need, then install this automatic CO_2 system yourself.
Walter Kidde & Co., Inc., 40 E. 34th St., New York 16.



REDUCED SIZE AND WEIGHT make a new G-E (Form G) fractional horsepower motor extremely compact. New motor (left) weighs half as much as motor it replaces (right).



BETTER VENTILATION means double-ended ventilation. Each half of motor has its own circulating system. Air taken in through end shields is discharged through drip-proof exhaust vents.

FOR YOUR FACTORY OF THE FUTURE

A Basic Motor

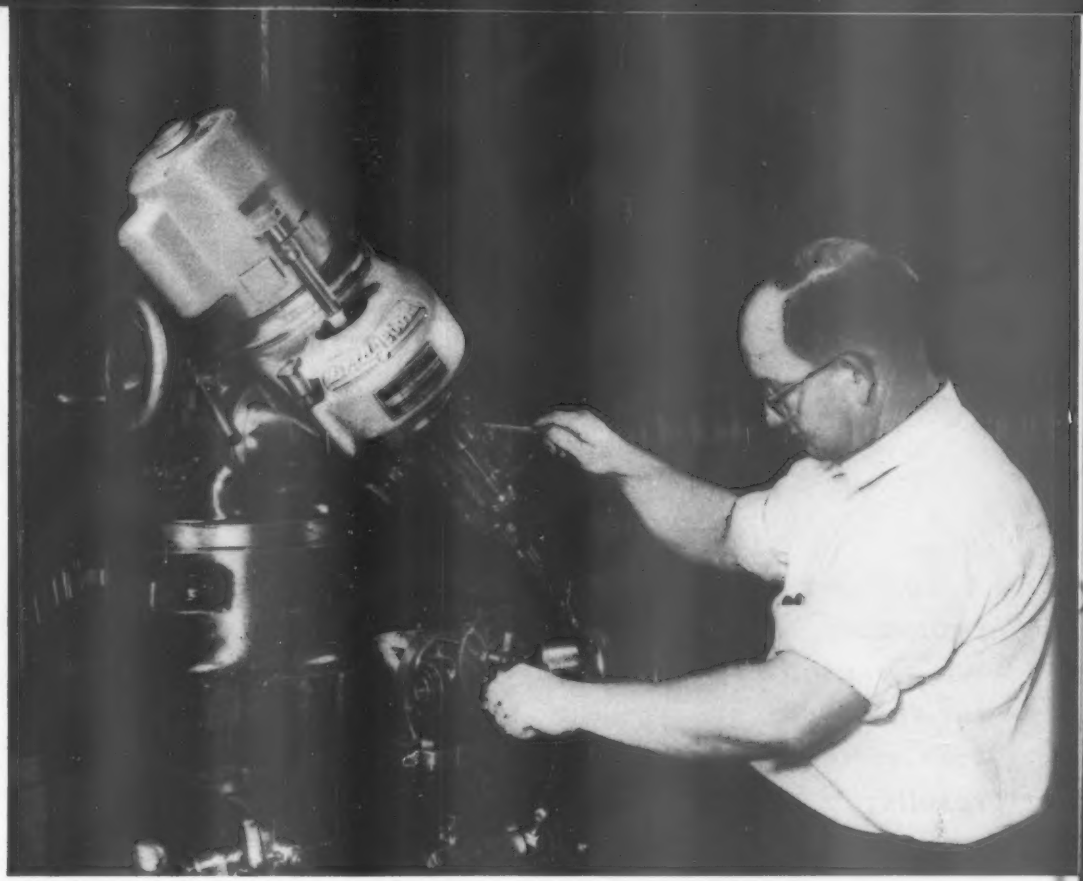
Not a redesigned line, but a really new family of motors. That's how General Electric describes its new series of fractional horsepower a-c motors. G-E claims it gave its engineers free rein to throw out conventional design—to start from scratch and design a new motor.

The Form G series—though not radically different in appearance—presents these four important changes.

1. Greater versatility. It's the first general purpose motor, say G-E, that is recommended for all-angle operation.

2. Improved insulation. Nylon, other new materials, give an increased factor of safety, and a life rating of over fifty years.

3. Better ventilation. The first double-ended



INCREASED VERSATILITY gives the Form G motor a wide range of plant applications. Improved bearings, lubrication, and insulation make it the first general purpose sleeve-bearing motor recommended for all-angle operation. The totally-enclosed motor, shaft-mounted on the machine tool above, can be rotated to any position, yet retain its protective features.

With Flexibility and Long Life

system used on motors of this type.

4. Reduction in size and weight. A saving of as much as 50% on some models.

The new Form G series includes polyphase, capacitor-start, split-phase, and permanent split-capacitor types—in either open drip-proof or totally enclosed fan-cooled models. They come in a complete range of standard horsepowers, speeds, voltages, and frequencies.

Applications include pumps, fans, blowers, compressors, motorized tools of all kinds. Though greatly changed in size and design they conform to all NEMA specifications.

Wide range of use of the Form G motor eliminates the need for specially enclosed or ball-bearing motors in many applications. Thanks to a new bearing design, and an improved oil recirculation system, the motor operates safely regardless of bearing position or the direction of the load. And at any angle of operation totally enclosed and drip-proof models lose none of their protective features.

Improved insulation, though, may prove to be the sleeper in the Form G motor. No cellulose or other natural insulating materials have been used. Instead G-E has gone over to nylon for the first time. Test results indicate a better than 50-year life for the new insulation. And though G-E is slow to suggest any increase in operating temperature, the company does claim a greatly improved factor of safety against accidental overloads.

General Electric Co., Schenectady 5, N. Y.

Turn the page

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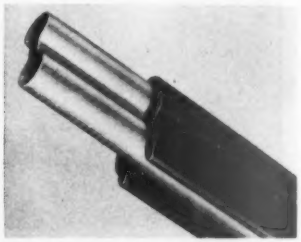
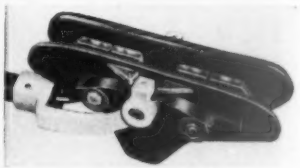
NEW ELECTRICAL EQUIPMENT

Begins on page 122



Snap-on insulation for conductors and...



a new-type shoe collector give you...

Low-Cost Safety for Trolley Systems

You don't have to spend much to insulate exposed conductors on overhead cranes and hoists. Not if you can use Insul-8-Bar.

Insul-8-Bar can be applied to existing figure-8-bar conductors without need for dismantling. You just snap on the special sheath insulation. And add new trolley shoes to your moving equipment. The sliding shoe contacts the conductor through a narrow, continuous opening at the bottom of the insulation. On top and sides, though, the electrified conductor is fully protected.

The figure-8 insulation can be cut to any size. Maker claims one man can insulate 100 feet of conductor in ten minutes. You can adapt the system to curves, switches, and crossovers, too.

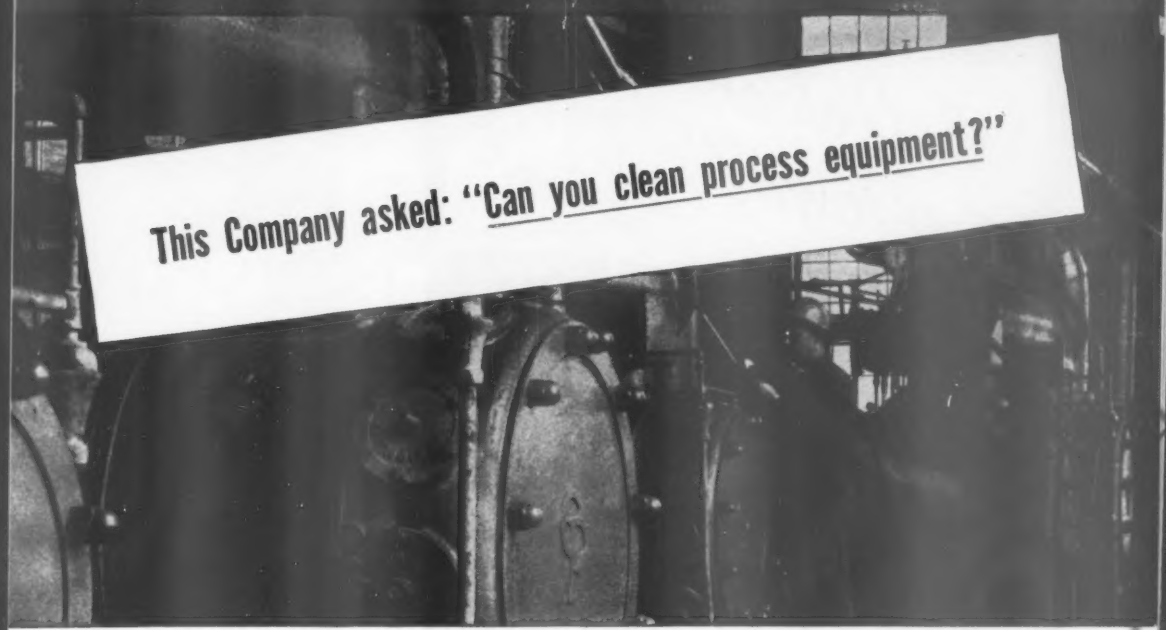
The present Insul-8-Bar system fits standard 1-in. conductors. It's rated at 60 amperes. Larger and smaller amperage versions are planned.

Benbow Mfg. Co., 1285 Rollins Rd., Burlingame, Calif.

Turn the page

DOWELL SERVICE

CHEMISTRY APPLIED TO MAINTENANCE CLEANING PROBLEMS



Dowell Service cleaned *THREE* cooling jackets in 7 hours!

In a manufacturing plant, the cooling efficiency of water jackets on three air compressors was lowered by an accumulation of deposits. *Without interrupting operation of the compressors,* Dowell engineers cleaned the jackets in 7 hours. As a result of Dowell Service, the cooling on these compressors was increased 50°F. with one-third less water. Inter and after coolers were cleaned in the same operation.

This is just one example of effective Dowell Service. Similar results have been obtained on the heating and cooling jackets of many types of process equipment—such as reaction tanks, press molds, and rubber and plastic fabricating rolls and mixers.

Dowell furnishes trained personnel, pump trucks and control equipment. Dowell engineers apply liquid solvents according to the technique demanded by the job: for example, by filling, spraying, jetting, cascading or vaporizing. The solvents are specially prepared for each job and designed to dissolve and disintegrate deposits quickly. Dismantling is unnecessary and downtime is kept to a minimum.

With experience gained in thousands of jobs, Dowell engineers offer fast cleaning service on many different kinds of equipment in your plant. Call the nearest Dowell office today for your FREE consultation.

Other recent Dowell jobs:

Heat transfer efficiency of seven press platens used in rubber vulcanizing was lowered by accumulation of iron oxide deposits. In just 8 hours, Dowell Service restored the designed heat transfer rate and reduced operating costs.

•

The ammonia liquor cooling coils in a coke works became heavily encrusted. Dowell Service removed the deposits without interrupting operations. Result: A daily savings in coal and steam of $167.28.

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A boiler was making only 12,000 lbs. of steam per ton of coal. After Dowell Service, production increased to 18,000 lbs. of steam per ton of coal . . . a 50% increase in efficiency.

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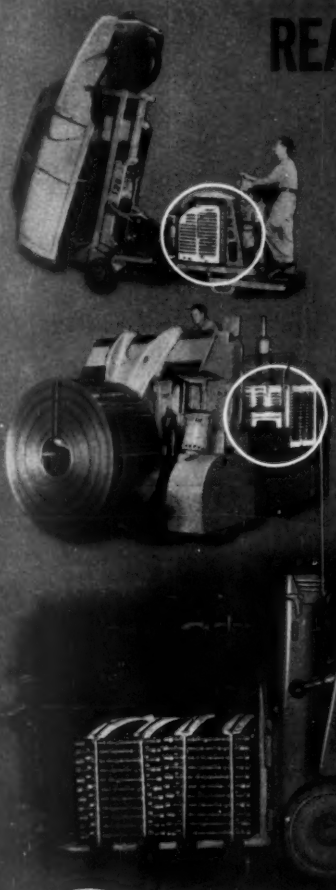

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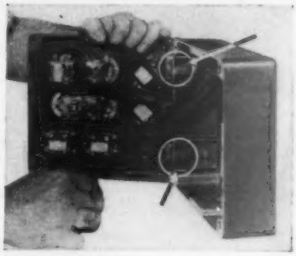
NEW ELECTRICAL EQUIPMENT

Begins on page 122



Oil-Tight Controls With Hinged Cover

Square D's oil-tight control stations now have hinged covers to simplify wiring and maintenance. A sliding internal hinge makes possible the advantages of hinged cover construction without sacrificing the oil-tight seal between box, gasket, and cover. Full details of the new line in Bulletin 9001 Type T.

Square D Co., 4041 N. Richard St., Milwaukee 12, Wis.

■

Line of Lightweight Electrical Connectors

The Titeflex connector is designed to meet extremes of temperature corrosion and vibration. But, says its maker, you get additional advantages because of an unusual method of assembly that permits a wide range of wiring arrangements.

The Titeflex connector comes in 17 shell sizes, conforming to AN sizes 8 through 36. You can get them for cord connections,

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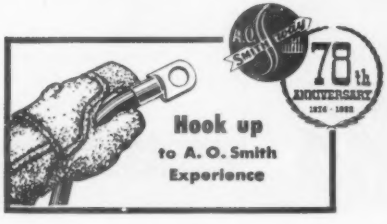

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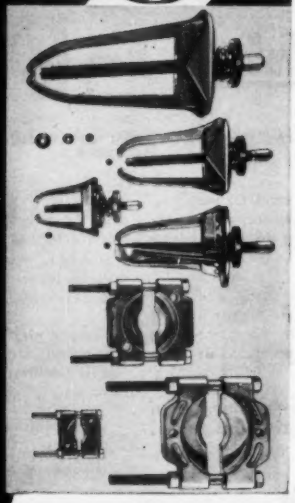
Write for the Snap-on Industrial Catalog and general catalog of 4,000 hand and bench tools. A nearby Snap-on factory warehouse is ready to give you immediate service on all your tool requirements.



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8044-D 28th AVENUE, KENOSHA, WISCONSIN
*Snap-on is the trademark of Snap-on Tools Corporation

NEW ELECTRICAL EQUIPMENT

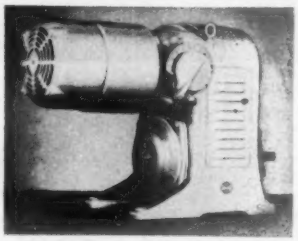
Begins on page 122

shielded assemblies, and bulkhead or box mountings.

Company says unique design eliminates clamps, saves space, facilitates harness assembly, and permits easy changes in wiring arrangements. In assembly, terminals can be removed from the connector block, soldered or crimped to the wire ends, and then reinserted in the connector. This eliminates difficult soldering in the confined space of the connector shell. It also eliminates the need for twisting slack wire into the connector after completing the assembly.

Titeflex, Inc., 500 Freylinghuysen Ave., Newark 5, N. J.

■



Variable Drive With Explosion-Proof Motor

In hazardous locations you may have had to connect an explosion-proof motor to a separate speed changer. Now you can get the two in one—an integral speed changer and explosion-proof motor on one base. The savings: less space and no intermediate connections.

The drives are standard members of the Varidrive line. The motors come in output speeds from 2 to 10,000 rpm., in ratings from 1 to 20 hp. More details in company bulletin.

U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles

Turn the page

Cash in Your Scrap!

MORE HYATTS than ever in "The Factory of the Future"

More and more Hyatt Roller Bearings will play an important part in smoother operating, longer-lasting machinery and equipment in the "Factory of the Future."

Consider the past, present and future of Hyatts and you'll understand why most manufacturers of machines and equipment "build in" Hyatt Roller Bearings wherever wheels, shafts and gears turn.

PAST—Hyatts have been serving industry for 60 years.

PRESENT—Leading manufacturers of lift trucks... cranes...conveyors...hoists...trolleys...hand trucks... casters...trailers...motors and other equipment "build in" Hyatt Roller Bearings to give you more efficient service.

FUTURE—Hyatt is enlarging its present plants and installing new facilities right now, in anticipation of the future machines you will build with Hyatts and the equipment which will help you to build them. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

CONTROL YOUR COSTS with PRINTWEIGH

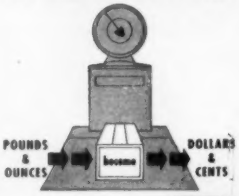
Printweigh keeps stock room records RIGHT!

STOP human errors in reading, remembering, recording

Toledo Printweigh Scales can help you *eliminate waste* and *improve accuracy of your control records* in receiving, stock rooms, batching, shipping and other operations in all plants today!

Printweigh stops errors . . . provides *printed* weight records . . . assures you that the accurate indication of the Toledo dial will reach your accounting records without chance of human error. Prints *directly* in big, clear figures . . . on thick tickets . . . on large or small sheets . . . on strips . . . with extra copies. Saves time, stops losses, assures *accurate* weights *accurately* recorded! Send for bulletin 2021 on modern weight control. Toledo Scale Company, Toledo 1, Ohio.

On your scale MATERIAL becomes MONEY

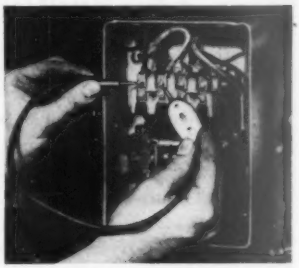


TOLEDO®

HEADQUARTERS FOR SCALES

NEW ELECTRICAL EQUIPMENT

Begins on page 122



Ground Tester

This pocket-size Dandy-Lite tests for shorts and grounds on lines from 90 to 550 volts ac-dc. It works on the neon glow lamp principle. It's trouble-free and safe to use, according to the Neo-Lite people. Price: $1.00.

Neo-Lite Mfg. Co., 915 Taylor Ave., Rockford, Ill.

■

Totally Enclosed Motor Line

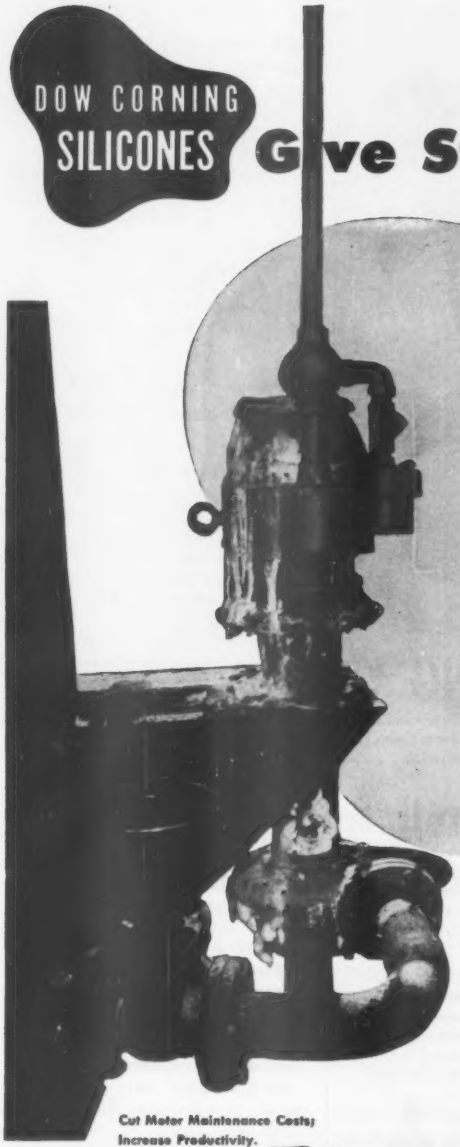
The Hoover Co. has introduced two new lines: totally enclosed and totally enclosed fan-cooled motors ranging from ¼ to 3 hp. Motors are designed for heavy-duty use where dust, wood chips, or metal shavings are a problem.

Smaller ratings are totally enclosed. Intermediate ratings built with smooth field-ring construction are totally enclosed, fan-cooled. Larger ratings, in addition, are provided with external fins for even greater heat dissipation.

Motors are easy to clean, says

DOW CORNING SILICONES

Give Standard Motors More Stamina



They saved $2100 and got greater overload capacity by rewinding with Class H insulation

Increased production schedules made it necessary to get 50% more pumping capacity out of a line of 22 mixing pumps. Exposed to outdoor weathering and to a variety of soluble salts, these pump motors rated at 2 h.p. were already taking all the punishment they could stand. Estimated cost of new 3 h.p. motors, plus installation of new mounts and brackets was $4400. Rewinding the old motors with Dow Corning (Class H) insulation, plus re-installation on the original mounts came to only $2300. That's a saving of $2100, plus a bonus of greater overload capacity and better chemical resistance.

The fact that Class H insulation has been used so successfully to up-rate motors proves that Dow Corning Silicones give standard motors more stamina. That means you can eliminate most of your repeated motor failures by specifying Class H insulation. That includes failures due to high ambient temperatures as well as high operating temperatures caused by overloads, high starting loads or rapidly reversing service; failures due to a combination of heat and excessive moisture or corrosive atmospheres. Pump motors, fan and blower motors, motors driving centrifuges or crane hoists, traction motors and motors in reversing service can be given as much as 50% more overload capacity. Life expectancy of Class H insulation made with Dow Corning Silicones is in the range of 4 to 100 times the life of Class B insulated equipment under comparable operating conditions. And Class H costs very little more than the second best class of insulation.

Cut Motor Maintenance Costs; Increase Productivity.

MAIL THIS COUPON *Today*

Dow Corning Corporation, Dept. L-16

Please send me

- ☐ More information on Class H Insulation
- ☐ List of Class H Rewind Shops
- ☐ Sources of supply for new Class H Equipment

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

DOW CORNING CORPORATION
Midland, Michigan

Atlanta • Chicago • Cleveland • Dallas
Los Angeles • New York • Washington, D. C.

In Canada: Fiberglas Canada Ltd., Toronto • In Great Britain: Midland Silicones Ltd., London

BRUNNER SINCE 1906 AIR COMPRESSORS

...boost the EARNING POWER of your plant!

BRUNNER SINCE 1906
AIR COMPRESSORS
are available in 73 different models for air volume from 1.13 CFM to 91.0 CFM.
Single Stage from ⅜ to 2 hp.
Two Stage from 1½ to 15 hp.
Horizontal and Vertical Styles

Brunner compressed air is the lowest cost labor available—and in adequate supply. An always available volume at every point of use will step up production—give better control over manpower, machine tool and processing efficiency. The more you use it the more it will add to manufacturing earnings.

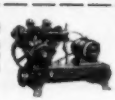
Brunner Air Compressors boast an industrial service record of 46 years standing. Here is air power application experience you can "hire" by a phone call. A Brunner sales and service representative is located in every industrial area and he talks your language.

We will send his name and address along with the new Brunner catalog

Let this Air Compressor Catalog show you why Brunner is specified by men who know air compressor operating advantages. Then call your local representative for the answers to any questions, including price. Just say, "Send the Brunner Air Compressor Catalog" on your letterhead and mail it to:

BRUNNER MANUFACTURING COMPANY, UTICA 1, N. Y., U. S. A.

BRUNNER SINCE 1906
REFRIGERATION Condensing Units from ¼ hp. to 75 hp. 69 Air and Water Cooled Models.



AIR CONDITIONING Self Contained Units to 10 hp. Condensing Units for Remote Installation to 75 hp.

the maker. Whenever necessary, the fan shroud can be removed, exposing the entire cooling system. It's not necessary to disassemble or remove the motor.

The Hoover Co., Kingston-Conley Div., 8 S. Michigan Ave., Chicago 3.

■

Mercury Lamps That Stay Cleaner Longer

First general-purpose mercury lamps to have built-in reflectors are now being made by General Electric. The new lamps should need no cleaning or other maintenance throughout their lives. Big application will be in dirty industrial areas—foundries, welding shops, etc.—or wherever lamps are hard to reach.

The new lamps come in 400-watt size. They're housed in a standard R-52 bulb, have a life rating of 3000 hours at five hours burning time per start, and 4000 hours at 10 hours per start.

Model H400-R1 generates light of the regular mercury color. It has a lumen output of 14,500, costs $24. Model H4000-RC1 has a color-correcting phosphor coating that improves color quality of the light. Light output is 10,000 lumens, price is $28.

General Electric Co., Nela Park, Cleveland 12.

■

1000-WATT MERCURY LAMP for general industrial use is designed to fill gap between the 400- and 3000-watt lamps in the mercury line of General Electric Co., Nela Park, Cleveland 12. High efficiency lamp produces 52,000 lumens. Life rating is 4000 hours at 10 burning hours per start. The lamp operates in any burning position.

Turn the page

Cash in your Scrap!

The Univac Fac-tronic System processes both numeric and alphabetic data from metallic tape *without special coding* . . . delivers results in typewritten form ready for immediate use.

sensational new "fact-power"

unleashed by Remington Rand UNIVAC

To keep pace with the production tempo of the "Factory of Tomorrow," now you can have, first thing any morning, complete facts and figures, analyzed and summarized, on yesterday's performance of your company . . . in production, in sales, in procurement or any other major or minor activity.

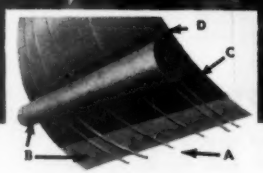
"Fac-tronics"... Univac's almost unbelievable feats in computing, sorting, classifying and reporting business data . . . now make it possible to formulate "fact-powered" decisions in the merest fraction of the time previously required. And what's more, highly pertinent analyses and forecasts that were never even attempted before, are now easy and almost completely automatic. The way is clear for phenomenal improvements in sales and production planning and coordination.

And the same versatile Univac equipment will help management multiply clerical productivity many times over in every phase of record keeping and accounting. Univac is just as effective in a routine job such as payroll preparation or cost distribution as it is in complex statistical and mathematical projects.

To learn more about Univac's virtually unlimited potentials as a practical aid to management, visit the nearest Remington Rand Business Equipment Center or write to Room 1025, 315 Fourth Ave., New York 10.

Eckert-Mauchly Division REMINGTON RAND INC.

"Snake Tape" seals 'em STRONGER in 1/3 less time



Sturdy cords (A) for strap-like strength. Two layers of select kraft (B) bonded with asphalt (C) to keep out wet. Best animal glue (D) for perfect seal. 100 yard rolls; 6 widths. Easily dispensed by "cut-off" type machines.

Save Time! Motion study photos show how sealing labor is cut two-thirds. Average time with 6 strips of non-reinforced tape — 38.5 seconds. Only 11 seconds with 2 strips of Snake Tape.

Sealed STRONGER because Angier Snake Tape is reinforced!

Sealed FASTER because only 2 strips give more than usual protection.

FREE 20 yard test sample . . . write

Angier

Angier Corporation, Framingham 1, Mass.
Industrial Protective Papers Since 1895
Distributors in Principal Cities

WHAT'S NEW IN EQUIPMENT
Begins on page 122

AUXILIARY EQUIPMENT

Electric Air Drier for Stockrooms

Latest Westinghouse air drier will dehumidify an enclosed space up to 10,000 cubic feet. The drier is small, portable, operates on standard 115-volt a-c service. It will remove up to three gallons of water from the atmosphere each day.

The dehumidifier needs no plumbing or other permanent installation. Optional timer clock provides intermittent operation wherever conditions don't require continuous dehumidification. Price: $151.50. Timer clock: $9.95.

Westinghouse Electric Corp., Electric Appliance Div., East Springfield, Mass.

■

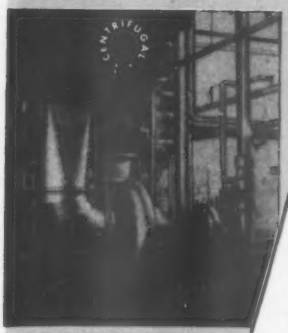
THERE'S NO CLOGGING or flooding in new automatic air oiler, according to maker, Robinson and Lee, 347 Madison Ave., New York 17. The unit—Model BR—feeds a pre-mixed mist of oil and air to pneumatic tools and machines. You install it in the air line as close to the tool as possible. The oiler cycles with the machine being lubricated, needs no delicate adjustments.

■

NEW WET BLASTING MACHINE of American Wheelabrator & Equipment Corp., 1115 S. Byrkit St., Mishawaka, Ind., has a gentle touch in removing rust and scale from precision parts. Control is so close, says maker, that you can clean parts without destroying tolerances, or dulling sharp lines and edges.

Turn the page

BEFORE BUYING *any* BLOWER COMPARE THESE ESSENTIALS



Single-Stage, Type OIB Centrifugal Blower in food processing plant. Steam turbine drive. Capacity 12,000 cfm.

- ☐ Choice of Rotary or Centrifugal
- ☐ Capacity matched to the job
- ☐ Easy accessibility
- ☐ Ruggedness
- ☐ Ease of installation
- ☐ Ability to handle overloads
- ☐ Long-time durability
- ☐ Freedom from breakdowns
- ☐ Low maintenance costs
- ☐ Engineering assistance
- ☐ Proved reputation of maker
- ☐ Customer satisfaction

When production depends so vitally on adequate handling of gas or air, you can't afford to take chances on the performance of your blowers or exhausters. It's better to be safe than sorry.

So, for new installations or replacements, we suggest that you evaluate the equipment by the above standards of comparison. This will help determine the unit that will be most effective, economical and reliable for your specific applications.

Be sure to include the R-C *dual-ability* line of both Centrifugal and Rotary Positive types. Remember that only we offer you this *dual choice*—with unbiased recommendations from almost a century of experience. With capacities from 10 cfm to 100,000 cfm or higher at moderate pressures, R-C equipment has a long record of outstanding performance in industrial applications.

We'll gladly send detailed information for comparison—or supply engineering help if we can be of service.

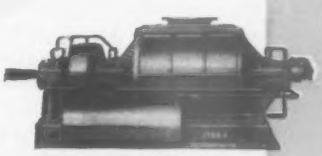
ROOTS-CONNERSVILLE BLOWER CORPORATION
521 Central, Connersville, Indiana

THE *DUAL-ABILITY* LINE OF MODERN EQUIPMENT TO HANDLE GAS AND AIR

Multi-Stage Centrifugal Exhausters

Single-Stage Centrifugal Blowers

Rotary Positive Blowers



Rotary Positive Gas Pumps

ROTARY

Type RCDH Blower in electric power plant, with capacity of 3,380 cfm.

Positive Displacement Meters

Inert Gas Generators

Reg. U.S. Pat. Office

ROOTS-CONNERSVILLE

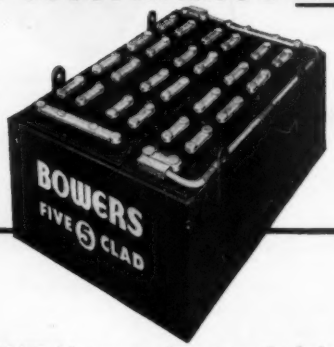
BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

only BOWERS has the revolutionary
modern power
GRID

to operate industrial trucks at

Peak Performance Longer!



INVESTIGATE this newest advancement in design, construction and function of industrial truck battery grids. This entirely new principle in grid design maintains full voltage at all loads.

Actually "years ahead," this is a grid which permits *power* to flow from all sections of the plate with an absolute minimum voltage drop. An additional feature of the Bowers Modern Power Grid is that a far greater percentage of its members is buried in the plate's active material. This minimizes grid corrosion and CONSIDERABLY INCREASES THE LIFE OF THE PLATE. Get all the facts—GET THE MOST FOR YOUR BATTERY DOLLARS—GET BOWERS, today!

power-hour after hour!

plus ***5-CLAD*** *insulation for* ***LONGER LIFE***

BOWERS FIVE (5) CLAD **BATTERIES**
for industrial trucks

built and backed by DEPENDABLE battery specialists
BOWERS BATTERY & SPARK PLUG CO., READING, PA.

NEW AUXILIARY EQUIPMENT

Begins on page 134

Low Cost Air-Mover

Intermittent or emergency ventilation can be provided quickly and cheaply, says the maker, with an Air-Mover exhauster. The device has no moving parts, costs about one-tenth as much as an electrically-driven explosion-proof blower and exhauster.

Air-Mover runs on compressed air or steam. The air or steam expands at high velocity in the Air-Mover, drawing with it large volumes of the atmosphere to be moved. Air-Mover can be used as either a blower or an exhauster. It's safe to use in hazardous atmospheres as there are no moving parts.

There are three models with air removal capacity of 800, 3150, and 5160 cfm. Units run on line pressures of 70, 80, and 90 psi., respectively. You'll get full details in Bulletin DP-5.

Mine Safety Appliances Co., Braddock, Thomas, and Meade Sts., Pittsburgh 8.

■

AIR CONTROL VALVE made by the Bellows Co., 230 W. Market St., Akron, Ohio, is electrically controlled but explosion-proof. This 4-way directional air valve meets Group D, Class I standards for wiring in hazardous locations. It's a modification of the Bellows Electroaire valve.

Turn the page

5 a.m.

A bottle of milk is the last scene in the last act of the cow-to-cup drama.

The real stars in this drama are milking machines, pasteurizers, bottle washers, homogenizers, and delivery trucks. Synthane—a laminated plastic—plays an unseen but essential part in these and other kinds of electrical and mechanical dairy equipment.

The dairy industry appreciates, as you may, the fact that Synthane is strong light in weight, chemical-resistant, easily machined, and a good electrical insulator—all rolled into one. And that it is available in sheets, rods, tubes, and fabricated parts.

Try Synthane laminated plastics yourself. There is an interesting 26-page catalog of its properties and possibilities waiting for you. Synthane Corporation, 4 River Road, Oaks, Pennsylvania.

AIRCRAFT electronics system part, made from Grade LE Synthane. Application requires good electrical properties, resistance to moisture, retention of size and shape at elevated temperatures.

Synthane-one of industry's unseen essentials

SYNTHANE

LAMINATED PLASTICS

For Baking • Drying • Degreasing • Dehydrating • Preheating

FOSTORIA INFRA-RED

MOST EFFICIENT OF ALL INDUSTRIAL OVENS

Cuts Unit Costs
Substantially reduces all operating cost factors. Lowest "per piece" production expense.

Speeds Production
Fastest of all heating methods. Ideal for conveyorized operations.

Saves Floor Space
Smaller oven because of high efficiency. Also easily suspended from ceiling to save floor space.

Saves Manhours
Easily turns out more pieces per day with fewer people.

3 FOSTORIA OVENS AT INTERNATIONAL HARVESTER COMPANY

Picture above shows 74 ft. ceiling-mounted oven used by International for baking paints on hoods, fenders and other sheet metal parts for military trucks. Average baking time to government specifications is 30 minutes with connected load of approximately 150 KW. Inset picture at top shows 37 ft. oven used for baking various color finishes on International's line of civilian, sleeper and military truck cabs. Baking time to government specifications is 30 minutes. A third oven 29 ft. long, not shown, is used for touch-up finish baking on completed military trucks.

Throughout industry, Fostoria "Golden Wall" Evenray Infra-red has become the new high standard of efficiency for finish baking and other heating operations. This higher efficiency over any other Infra-red equipment or heating method is obtained by such vital and exclusive Fostoria features as gold plated oven walls and Evenray reflectors. Fostoria ovens give greater productive use of energy than any other equipment — lowest "per unit" production cost and uniform quality. May we show you why many thousands of plants have switched to Fostoria Infra-red?

WRITE FOR COMPLETE FACTS
Send for this brochure of technical facts on Infra-red with case histories of many installations. Tell us about your particular problem.

THE FOSTORIA PRESSED STEEL CORPORATION
FOSTORIA, OHIO

ONLY WITH FOSTORIA GOLDEN WALL EVENRAY INFRA-RED OVENS

- Highest productive utilization of energy—lowest energy loss.
- Uniform heat distribution to all product surfaces.
- Instantaneous heat, instantly controlled — no stand-by time — no overheating.
- Lowest unit production cost and finest, most durable finishes.

Listed by Underwriters' Laboratories, Inc.

NEW AUXILIARY EQUIPMENT

Begins on page 134

Self-Contained Dust Collector

Here's a unit-type dust collector that services one machine or operation. It's designed for the plant that doesn't have enough dust sources to justify a central installation.

Dustbuster, as it's called, is a recirculating-type collector. It contains a motor-drive, paddle wheel, self-clearing fan, filter, and storage bag. A single length of flexible hose connects to the discharge outlet of the dust-generating machine.

The Dustbuster is rated at 600 cfm., has a storage capacity of 31 gallons. The 1/3-hp. motor can be supplied for either 110-volt, single-phase, or 220- or 440-volt, 3-phase operation.

Aget-Detroit Co., 612 First National Bank Bldg., Ann Arbor, Mich.

■

NO OIL IS NEEDED in the pumping chamber of three vane-type pumps made by Gast Mfg. Corp., Benton Harbor, Mich. Pump rotor has sliding carbon vanes that lubricate themselves. You get double advantage of no lubrication and delivery of oil-free air. Vacuum and pressure models up to 24 cfm.

Turn the page

16 OR 100 WAYS

TO HANDLE MATERIALS FASTER, CHEAPER WITH LORAIN

16 of the most common front end attachments for handling materials with a Lorain Crane are shown below. There are many, many more. But regardless of what you have to handle—in size, shape or type of material—a Lorain can do the job faster, better, at lower cost—operate in any kind of weather, day or night, regardless of ground conditions. One man at the controls of a Lorain replaces hard-to-get labor, moves quickly to wherever material has to be handled. A Lorain is truly a "one-man gang." Available on crawlers or rubber-tire mountings in capacities up to 45 tons. See your Thew-Lorain Distributor for uses and design features that will prove Lorains' superiority.

A 20-ton capacity Lorain Self-Propelled Crane, with 4 speeds in both directions up to 7 m.p.h. Other models available from 6 to 45 tons lifting capacities on crawlers or rubber-tires.

THE THEW SHOVEL CO.
Lorain, Ohio

✓ FOR BULK MATERIALS

CLAMSHELL	ORANGE PEEL	DRAGLINE	MAGNET
Crushed Stone Ashes · Cinders Sand · Coal · Slag Ore · Excavations	Scrap Ashes Cinders Excavations	Crushed Stone Ashes · Cinders Ore · Excavations Sand	Scrap · Pig Iron Turnings · Rails Pipe · Castings Punchings

✓ FOR HEAVY PIECES

HOOK BLOCKS WITH SINGLE SLING	HOOK BLOCKS WITH BRIDLE SLINGS	HAIRPIN HOOK	SPECIAL HOOKS
Machinery Stacks · Valves Rolled Steel Bar Steel	Rolled Steel · Rods Forms · Crates Boxes · Cases · Pipe Lumber · Billets	Heavy Pipe Castings Fittings Tanks	Boxes · Cases Kegs · Castings Machinery Barrels · Drums

✓ FOR LOOSE OR STACKED MATERIALS

TONGS	CLAMPS	GRABS	GRAPPLE
Railroad Ties Timber · Logs Poles · Bales Rail	Lumber · Ties Forms · Shapes Bar Steel Sheet Steel	Poles Railroad Ties Pulpwood Mine Timbers	Boxes · Crates Pipe · Pulpwood Barrels · Lumber Bundles

✓ FOR CONTAINERS OR WEIGHTS

CONCRETE BUCKETS	SKIPS	TOTE BOX	SKULL CRACKER
For handling concrete, pouring into forms, etc.	Ore · Cinders Foundry Sand Ashes Bulk Materials	For small finished or semi-finished parts	Breaking up scrap. Demolishing masonry

THEW LORAIN LORAIN CRANES FOR INDUSTRY

THOMAS

Flexible ALL METAL
COUPLINGS
FOR POWER TRANSMISSION
REQUIRE NO MAINTENANCE

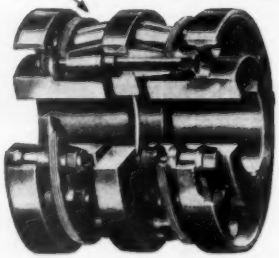
Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
1 to 30,000 RPM

Specialists on Couplings for more than 30 years

BACKLASH FRICTION WEAR and CROSS-PULL are eliminated
Lubrication is not required!

PATENTED FLEXIBLE DISCS



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT.

NO MAINTENANCE PROBLEMS.

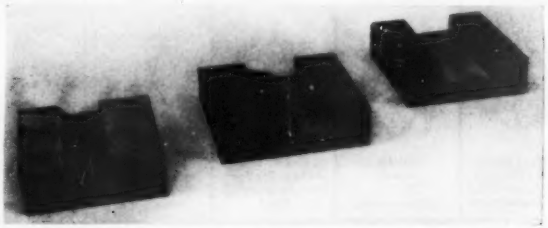
ALL PARTS ARE SOLIDLY BOLTED TOGETHER.

Write for the latest reprint of our Engineering Catalog.

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

MAINTENANCE TOOLS & SUPPLIES

BLASTING ELECTRODE powered by an ordinary d-c welding machine can...



...save time in milling tough alloy steel block. Electrode quickly blasts out 70% of metal to be removed, before milling machine finishes the job.

New Electrode Doubles as Machine Tool

The Eutectic people claim that you can take some of the load off your machine tools with their new ChamferTrode electrode. The ChamferTrode looks like an ordinary welding electrode. And it works on ordinary d-c welding equipment. But its job is to remove metals and alloys at high speed. A special coating, says Eutectic, gives the ChamferTrode its gun barrel blasting effect. You can use it to chamfer cracks, prepare worn tools for overlay, gouge out faulty welds, remove studs—or to speed up milling operations as shown above. You can use ChamferTrode on all metals and alloys. And it's a portable piece of equipment that you can move right up to the job.

Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing, N. Y.

Turn the page

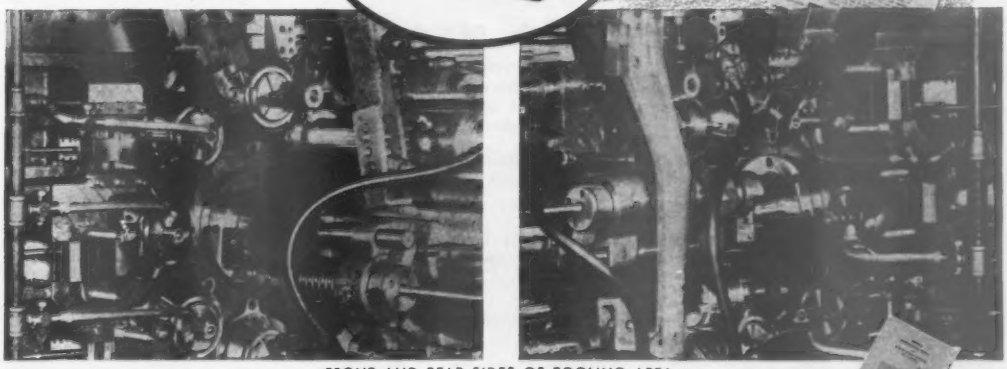
THE HEAT IS ON THE AUTOMATIC

For over fifty years American Mass Production has given increasing opportunity to the Multiple Spindle Bar Automatic. But now the heat is really on!

Not the early day flash fire, nor the production pressure kind, but *induction hardening* and *quenching*. The application is performed in one position of an otherwise orthodox setup on an eight spindle CONOMATIC, in the production of universal joint bearing races and wing bushings.

The documentary importance of this application is substantiated by feature articles which appeared in three of the Metalworking Industry's leading publications. Reprints are available at no charge. Just ask your CONE Representative or contact us direct.

Any usual, or unusual, job on an "Automatic" must run or fail. CONOMATICS give the dependable performance that make the innovationary type of job pay off and result in additional assignments.



FRONT AND REAR SIDES OF TOOLING AREA

A Comparison of ALL Automatics is in favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

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For the countless wiping jobs that occur in your plant . . .

★ You'll Save Time and Money with

MARATHON
Industrial Wipers

Whatever the wiping job, MARATHON Industrial Wipers will help you save two ways:

★ they cost less!

No matter what kind of wiping rags or shop towels you are now using, chances are MARATHON will cost you less. Our modern processing plant and great volume make it possible for us to produce finer wipers at lower cost.

★ they cost less to use!

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FM

NEW MAINTENANCE TOOLS & SUPPLIES

Begins on page 140

Tough Floor Patch Combines Metal, Rubber

Here's a really fast floor patch for heavy-duty industrial floors. Five minutes after you tamp Redi-Patch level, you can run 2-ton truckloads over the area without damaging the new floor surface.

Redi-Patch—a plastic filler—contains both metallics and pure rubber latex. Maker says it has a strength five times greater than ordinary floor-patch materials.

You can apply it to damp or dry concrete, asphalt, brick, or mastic floors. It's grease-, oil-, and gasoline-resistant. And contains no asphalt, stone, or similar aggregates. No plasticizer is needed.

Dasco, Inc., 1602 Thames St., Baltimore 31, Md.

■

Ladder Lifting Made Easier

In painting or overhead maintenance handling your extension ladder may be the toughest part of the job. If you could separate the two ladder sections, then move one section at a time, the job would be half as hard. You can do just this with a hinged extension ladder bracket patented by the Kal Sales people.

The bracket bolts to the bottom ladder, and guides the movement of the upper section like any standard ladder guide. But when you want to move from one job to another, you can open the bracket with a slight thumb pressure, and slide the top ladder off.

Kal brackets are Underwriters' approved. They come in sizes to fit most industrial ladders. More details in company literature.

Kal Sales, 4122 Chester Ave., Cleveland.

Turn the page

Take Your Pick of Performance

In the complete Fairbanks-Morse Pump Line you can pick the pump that best suits your ideas of performance, efficiency, capacity, head, initial and operating costs. Whatever your choice, you can be sure it will more than live up to your expectations . . . it's Fairbanks-Morse.

For complete information, call your Fairbanks-Morse pump expert or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

FAIRBANKS-MORSE,

a name worth remembering

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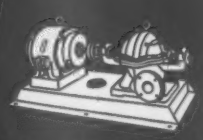
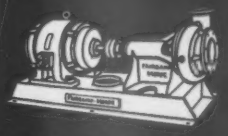
RAIL CARS • FARM MACHINERY • MAGNETOS



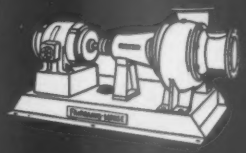
Two-Stage Centrifugal Pumps
Capacities: 100-560 G.P.M.

Builtogether
Centrifugal Pumps
Capacities: 5-1000 G.P.M.

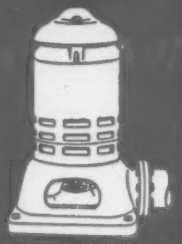


Base-Mounted Centrifugal Pumps
Capacities: 25-3000 G.P.M.

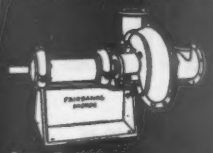
Frame Constructed
Rotary Pumps
Capacities: 1.3-450 G.P.M.



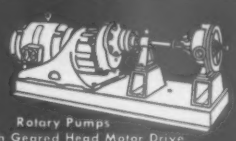
Horizontal Angle Flow Pumps
Capacities up to 100,000 G.P.M.



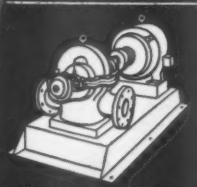
Deep Well Turbine Pumps
Capacities: 15-25,000 G.P.M.



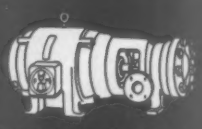
Paper Stock Pumps
Capacities up to
2500 G.P.M.



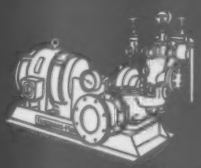
Rotary Pumps
With Geared Head Motor Drive
Capacities: 20-450 G.P.M.



Split-Case Centrifugal Pumps
Capacities: 50-50,000 G.P.M.



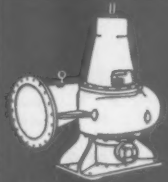
Two-Stage Builtogether Pumps
Capacities: 5-1000 G.P.M.



Centrifugal Fire Pumps
Capacities: 500-2000 G.P.M.

Bladeless Impeller
Food Handling Pumps

Vertical
Propeller Pumps
Capacities:
1250-216,000
G.P.M.



Vertical Angle Flow Pumps
Capacities up to
100,000 G.P.M.

Sewage and Trash Pumps
Capacities: 50-20,000 G.P.M.

Cincinnati

THE TAFT MUSEUM
now a famous Cincinnati landmark was once the residence of Mr. and Mrs. Charles Phelps Taft. Built in 1820 when architecture was influenced by classic forms, this historic house merits the visitor's attention for its charm and authenticity.

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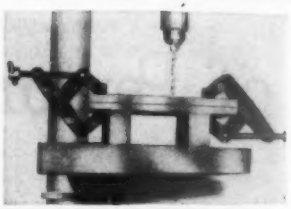
NEW MAINTENANCE TOOLS & SUPPLIES

Begins on page 140



Work-Holding Clamp

Here's a new version of the work-holding clamp. Maker claims it combines the advantages of a "C" clamp and a toolmaker's parallel clamp. Special ball-bearing trunnions in the clamp are said to eliminate twisting action, and to absorb vibration. Jaws open quickly with a twist of the clamp screw.

The Saxton clamp has three gripping faces for different holding jobs. The clamp comes in five sizes—1½, 3, 6, 9, and 12 inches.

Centinela Industrial Supply Co., 11930 Inglewood Ave., Hawthorne, Calif.

■

LONG TRAVEL AND SKIP STROKE features of a new drill unit give it a wide range of applications. It's similar to the standard traversing-motor shaft-type drilling unit made by the Black Drill Co., Inc., 1400 E. 222nd St., Cleveland. But the new model is specially suited for deep drilling, drilling in hard-to-get-at locations, and for accurate drilling in materials that require frequent chip clearance.

■

PUTTY-LIKE PLASTIC PASTE protects the outside surfaces of plating rinse tanks. The paste, easily applied with hand trowel, is not affected by acid spillage, plating salts, other corrosive chemicals. Further uses for this coating compound are under study by Munray Products, Inc., Cleveland.

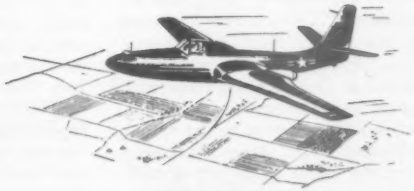
Turn the page

Making walkways for Banshees

Making non-skid walkways for airplane wings might not seem like a difficult problem. But keeping any kind of coating on jet-powered wings is next to impossible . . . the windstream tends to peel it off.

The McDonnell Aircraft Company, makers of the Navy Banshee jet fighter, asked 3M for a product that would stay on, yet be flat enough not to set up wind resistance and affect the plane's flight characteristics. 3M engineers suggested this: a primer coat of adhesive and a final coat of Corogard #22, a non-skid coating. The new walkway passed all flight tests, and is now part of the airplane.

Modern adhesives engineering is solving problems in many industries. When you investigate the possibilities of adhesives, come to 3M, leading producers of more than 1000 adhesives, coatings and sealers that do a top-quality job in all industries.



See what adhesives can do for you . . .

Want to know more about 3M corrosion- and abrasion-resistant coatings, or all-purpose Corogard coatings? Call your 3M salesman or write 3M, Dept. 34, 411 Piquette Avenue, Detroit 2.

3M COMPANY

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MAKERS OF "SCOTCH" BRAND PRESSURE-SENSITIVE ADHESIVE TAPES • "SCOTCH" BRAND SOUND RECORDING TAPE • "SCOTCHLITE" BRAND REFLECTIVE SHEETINGS • "3M" ABRASIVE PAPER AND CLOTH • "3M" ADHESIVES AND COATINGS • "3M" ROOFING GRANULES • "3M" CHEMICALS

ELECTROSTATICALLY CLEANED AIR HELPS REDUCE REJECTS

Can air conditioning also cut costs in *your* business?

In the precision machining of huge thrust bearings now made of alloy steel for hydroelectric units, close dimensional control is a *must* to assure the fine surface finish these heavy circular disks, or runners, require.

Bearings such as these frequently support loads in excess of two million pounds, and they must be flat within the limits of 0.0002 inches. Machining operations utilize a new boring mill, built for extra precision and rigidity. It operates in a specially constructed room where the air is electrostatically filtered and maintained at 70°F. Air control is an important factor both in producing a uniform product with the aid of boring mill and carbide tools, and in reducing rejects to one out of fifty. Prior to this modern use of air conditioning, runners were made of cast iron, and scrap loss ran as high as four out of five!

Air conditioning, today, occupies a place of high importance in American industry. It serves many businesses well. It helps cut costs . . . increases employee efficiency and morale . . . aids in producing better products easier and faster.

Review the subject with your own engineers. They may have many timely suggestions that can bring important, money-saving benefits to your business. And be sure to investigate equipment charged with "Freon" refrigerants. These refrigerants are widely used because they're safe, thoroughly dependable . . . contribute to the long life and economical operation of the most modern machines. E. I. du Pont de Nemours & Co. (Inc.), "Kinetic" Chemicals Division, Wilmington 98, Delaware.

DU PONT

150th Anniversary

Better Things for Better Living . . . through Chemistry

KINETIC

FREON

SAFE REFRIGERANTS

"Freon" is Du Pont's registered trade-mark for its fluorinated hydrocarbon refrigerants.

WHAT'S NEW IN EQUIPMENT
Begins on page 122

MATERIALS HANDLING

Handling scrap by magnet and . . .

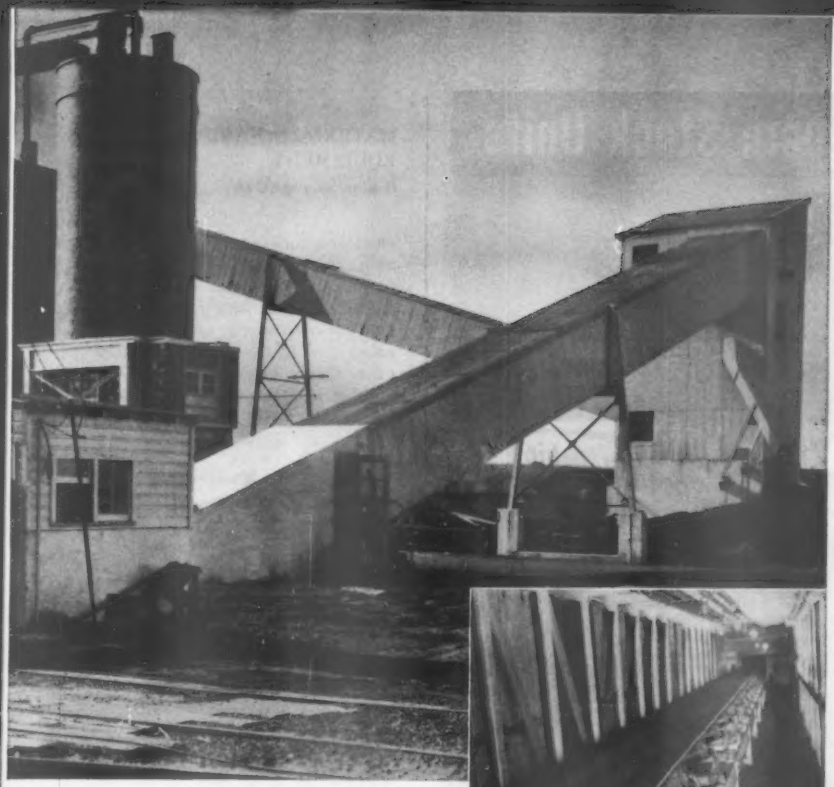
. . . Dumping shop-box containers are just two of the jobs of a new . . .

Versatile Truck Loader

The Hykap truck loader transforms a standard dump truck into a multi-purpose unit. Handling scrap and dumping shop containers are just two of its accomplishments. Hykap will also scoop up loose bulk materials, pick up drums, crates, and bales. And maker claims it's all a one-man operation.

You can operate the loader from the top of the truck cab or through auxiliary controls on the side of the truck. From his perch the operator can control loading and also drive and steer his truck.

The loader can be adjusted to any size dump truck, says the maker. Basic equipment consists of loading arms, hydraulic controls, and driver's platform. Special attachments—scoop shovel,



Starts fast at forty below...

This belt conveyor carries coal from railroad cars to overhead hoppers for a power company located in the northern part of the Midwest . . . so far north that temperatures frequently hit forty below zero. Starting the conveyor in that kind of weather meant lost time, wasted manpower. The bearing lubricant became so stiff that five or six men often were required to pull on the belt. Three hours a day frequently were lost in getting the unit in operation.

As many as a dozen conventional lubricants were tried without success before a change to STANOLITH Grease No. 42 was made on the recommendation of a Standard Oil lubrication specialist. None could match the ability of STANOLITH to provide easy starting at extreme low temperatures, and still maintain effective lubrication during high summer temperatures.

STANOLITH Greases are filling the bill in a wide range of industrial and processing applications because of their resistance to heat and to the washing action of water, and their ability to flow readily under wide variations in temperature. A Standard Oil lubrication specialist can help you take advantage of these special properties. A call to your local Standard Oil Company office is all that's necessary. Or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANOLITH
TRADE MARK
Greases

What's your problem?

Meet R. R. Rowlands, of Standard's La Crosse office. He is the lubrication specialist who worked with this power company to find the right grease for an especially tough job. And as a result of his work, the company was able to save considerable time in the operation of a coal conveyor.

His on-the-job service is typical of that available to all midwest plants through a corps of such lubrication specialists. You can be sure that the specialist in your own area has both the practical experience and the training in a Standard Oil Lubrication Engineering School that will result in dependable, thorough assistance.

Why not call your local Standard Oil Company office today? Put a lubrication specialist to work on your problem now. When he calls, be sure to discuss the advantages and performance records of these outstanding products:

STANOIL Industrial Oils—This multi-purpose line of oils provides cleaner operation of hydraulic units, supplies effective lubrication in air compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

CALUMET Viscous Lubricants—These greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of open gears and chains, better internal lubrication of wire ropes.

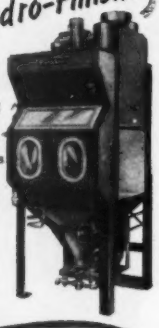
STANDARD OIL COMPANY STANDARD *(Indiana)*

NOW! Pangborn Stock Units for Blast Cleaning... Dust Control... Precision Finishing

Blast Clean with this Portable Unit!

Ideal for maintenance and many other jobs, including removal of rust, dirt, scale, etc. Economically cleans large objects like tanks, bridges, structural work before painting. Six sizes, stationary or portable, from . . . . **$170.00** and up.

Speed Polishing with Hydro-Finish!



Removes scale and directional grinding lines . . . prepares surfaces for plating and holds tolerances to .0001"! Liquid blast reduces costly hand cleaning and finishing of molds, dies, tools, etc. Models from **$1410.00** and up.

Stop Dust at the Source!

Pangborn industrial type Unit Dust Collectors trap dust at source. Machine wear is minimized, housekeeping and maintenance costs reduced. Solves many grinding and polishing nuisances and material losses. Models from **$286.00** and up.

Clean Small Work in this Blast Cabinet!

Ideal for producing smooth, clean surfaces on pieces up to 60" x 36" in size. Cleans metal parts, removes rust, scale, dirt, grime, paint, etc., in a few seconds. Saves money all year 'round. Models from . . **$319.00** and up.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

Pangborn MAIL COUPON FOR DETAILS

Check for more information

- ☐ Blast Cleaning Cabinets
- ☐ Blast Cleaning Machines
- ☐ Unit Dust Collectors
- ☐ Hydro-Finish Cabinets

PANGBORN CORP., 2100 Pangborn Blvd., Hagerstown, Md.

Gentlemen: Please send me more information on the equipment I've checked on the left. To be used for_____

Name . . . . . .

Company . . . . . .

Address . . . . . .

City . . . . . Zone . . . . State . . . . . .

electromagnet, and pick-up — adapt the Hykap loader to various plant jobs. You can use Hykap as a hydraulic lift platform to load its own truck, or as a light crane for lifting materials onto other trucks or gondola cars.

Efficient Equipment, Inc., 1621 W. Hastings St., Chicago 8.

■

Versatile Stacker

You can adjust the Universal power booster through a wide range of positions for different handling jobs. The conveyor trough pivots at the center like a see-saw. So you can use it for horizontal movement or vertical stacking and loading.

The portable unit is mounted on a swivel caster frame. Chassis has positive floor lock to keep conveyor in position during loading. Head and tail feeders are fully adjustable. They are 24 inches long, come equipped with either rollers or rough-top power-belt feeders.

The power booster comes in three sizes. The largest of the three has a conveyor length of 204 inches. Horizontal height of conveyor can be adjusted from 54 inches maximum to 45¼ inches minimum. Extreme tilt of conveyor is 33 degrees. Minimum pick-up height is 11½ inches, maximum delivery height is 122 inches. You have choice of 12-, 16-, or 18-in. belt width.

Industrial Engineering & Mfg. Co., Inc., Brimfield, Ind.

Begins on page 146

Conveyorized Inspection Tables

This inspection unit has built-in fluorescents for proper lighting, and roller conveyors for easy movement of materials. It can be installed as an integral part of your conveyor system, or set up as an independent unit.

The plywood work tables are reinforced with 2-in. planks, and covered with battleship linoleum. Each table has two electric outlets and a tray for tools and instruments. The light canopy is plywood, painted white inside. The canopy also doubles as a shelf for rejected parts. You can get these tables in various types and sizes.

Samuel Olson Mfg. Co., Inc., 2424 Bloomingdale Ave., Chicago

■

Fork Lift Truck for Yard Operations

This rough and ready fork lift truck will go almost anywhere on its tractor tires, says the maker. It's a good set for heavy-duty yard handling. Minimum under-

Pangborn CH Dust Collectors installed outside the Kingsbury shop collect dust from painting and finishing operations via booths and hoods.

One Pangborn Installation Solves 6 Dust Control Problems!*

Hoods exhaust dust from hand polishing and grinding booths to outside Collectors

FINISHING operations at Kingsbury Machine Tool Corporation presented a 6-fold dust control problem to Pangborn engineers. Several priming, lacquering and spray painting operations had to be protected from dust created in other finishing jobs such as snagging, grinding and smoothing.

To control these dusts efficiently, Pangborn recommended booths, tables and exhaust hoods. Four main booths, four snagging tables, one snagging bench and a bench grinder hood control the dust at the source. All these are exhausted to two CH Collectors located out-of-doors.

Kingsbury reports the complete system "highly satisfactory"—with these added benefits: Heating costs have been lowered substantially through recirculation of the cleaned air. Costly dust damage to adjacent machinery and products has been prevented. And workers' efficiency has increased due to cleaner working conditions.

What are your Dust Problems? Find out what Pangborn can do to solve them. Write today for Bulletin 909A. Address: PANGBORN CORPORATION, 2100 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Dust Control and Blast Cleaning equipment

Pangborn DUST CONTROL

STOPS THE DUST HOG from stealing profits

Your PROBLEM IS Our JOB

Working with a wide variety of band and power hack saw machines, Milford Specialists continually test MILFORD Blades under both normal and severe break-down conditions. The carefully tabulated results contribute substantially to the development of MILFORD Blades that give you maximum performance in the type of metal you cut. MILFORD Specialists make your metal cutting problems theirs. If necessary, special tests are conducted on your material to make sure you get maximum production at the lowest cost.

STANDARD OF QUALITY THE WORLD OVER

THE HENRY G. THOMPSON & SON CO.

SAW BLADE SPECIALISTS FOR OVER 75 YEARS

NEW HAVEN 5, CONNECTICUT

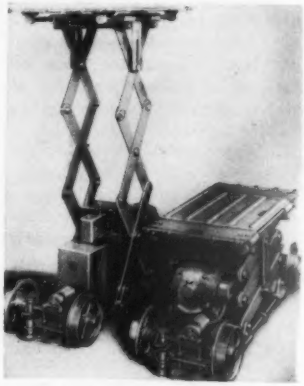
PROFILE AND BAND SAW BLADES
HAND AND POWER HACK SAW BLADES

clearance of 8 inches means that it can get around safely on soft or sandy terrain.

The Tracto-Lift comes in four capacities—3000, 4000, 5000, and 6000 pounds. Truck forks range in length from 30 to 60 inches. Maximum lifting height is 12½ feet.

Tracto-Lift Co., 2011 Baltimore, Kansas City 8, Mo.

■



Elevating Table That Runs on Tracks

Here's a different approach to "in-process" materials handling. It's a rail system of elevating platforms. These Portelvators operate on tracks that skirt storage shelves and processing stations. You move them manually, elevate them electrically. Table is quickly adjusted at each station to pick up or deliver material to be processed at the correct working height. Table is 24 inches wide, 36 inches long. A roller section is set into the table top to simplify handling.

Platform height ranges from 24 to 64 inches from the floor. Lift rate is 40 inches per minute. Capacity is 600 pounds.

The Hamilton Tool Co., Hamilton, Ohio.

Turn the page

More than 500 lbs. of pulchritude swing securely on a strip of "Tape-Strap" reinforcing tape.

Super-strong reinforcement for containers, too

TAPE-STRAP*

OK "Tape Strap" is approved by the Official, Southern, and Western Classification Committees (Rule 41, Sec. 8 (b), Supp. 29, C.F.C. No. 19) and by Railway Express Agency, Inc., (Supp. No. 36 to Official Express Classification No. 34)

Packaging costs drop . . . as much as 85% . . . when you switch to super-strong, easy-to-use "Tape-Strap" for carton reinforcement. This gummed filament tape has a tensile strength of 180 pounds per inch of width.

"Tape-Strap" is so strong that short, 10-inch strips are all you need for most applications. The tape is so quick and easy to apply that shipping room operations speed up. Users report spectacular time savings . . . as much as 75%.

You need no costly equipment to apply "Tape-Strap." It's quick, easy, and safe to use. No sharp edges to cut, and it's applied without pressure.

Write for free sample roll and complete data.

LEADERS IN THEIR LINE

*"Tape-Strap" is the trade mark of the brand of filament tape manufactured by Mid-States Gummed Paper Co.

MID-STATES GUMMED PAPER COMPANY
2517 South Damen Avenue, Chicago 8, Illinois

DROP TEST...

TAPE-STRAP holds after 126 falls. Four 10-inch strips of "Tape-Strap", one across each side seam, reinforce this Belsinger Box, loaded with 100 pounds of screws. After 126 falls in the drop tester, the carton is failing, but "Tape-Strap" still holds the seams.

BRANCH OFFICES: New York, Philadelphia, Cleveland, Detroit, St. Louis, Los Angeles

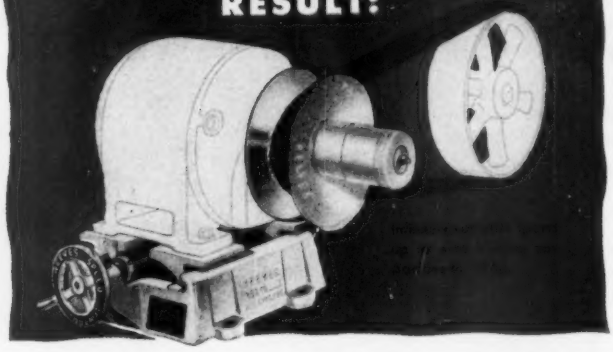
REEVES
Vari-Speed
Motor Pulley
Converts any standard, constant-speed motor to a Variable-Speed Drive

REEVES Motor Base provides sliding platform for motor. Handwheel or push-button control increases machine speed by moving motor toward driven machine; decreases speed by reverse movement.

Disc assembly mounts directly on motor shaft. This simple assembly consists of two cone-shaped discs and belt-tensioning spring.

V-belt connects disc assembly with driven machine.

RESULT:



● REEVES Vari-Speed Motor Pulley is the easiest, lowest-cost method of giving a constant-speed machine stepless speed adjustability. Eliminates all complicated electrical hook-ups, chain drives, gears, etc. . . . widens machine work range, increases rate of production and reduces production cost by providing the right speed for each operation under every changing condition—*without stopping the machine*. Send for complete information to Dept. F6

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized leader in the specialized field of variable speed control

STEPLESS! ACCURATE! POSITIVE!

REEVES Variable Speed Drives

MATERIALS HANDLING EQUIPMENT

Begins on page 146

Maintenance Man's Truck

To produce a truck that would solve maintenance handling problems Elwell-Parker combined a standard low-lift platform truck and a winch-powered crane. The 4000-lb. capacity platform will lift and transport skids, the winch pulls heavy loads on and off the platform. Crane boom pivots 180 degrees, has 2000-lb. capacity.

You can use the truck to transport maintenance material, move machinery, place motors or transformers, or to speed general plant repair work. The truck will also move, carry, and position heavy, odd-shaped castings, large assemblies, etc.

Truck comes as either a storage-battery or gas-electric unit. In both models individual motors power the drive, platform lift, winch and hook.

Truck is 134 inches long, 41 inches wide, 72 inches high. Hook has a maximum height of 57 inches, an outreach of 61 inches. Platform has a lift of 5¾ inches, a lowered height of 10 7/16 inches.

The Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3.

■

NEW ELECTRIC FORK TRUCK of the Lewis-Shepard Co., Dept. R-2, Watertown, Mass., is designed for dock and warehouse operations. The SpaceMaster 59 is built to be extra rugged, to have extra speed in hauling (6 mph.) and lifting (50 fpm.). Capacity: 1500 lb.

Turn the page

BUY HALLOWELL BASIC

MODEL 608 Basic with addition of two 3-tier drawer units and doors. Bench is 29" x 6' long with steel top.

ADD ACCESSORIES FOR EXTRA CONVENIENCE

Buy BASIC HALLOWELL Cabinet Benches. They're ideal for toolroom, testing laboratory, instrument shop—wherever precision work is done.

Simple, functional design blends perfectly with modern industrial interiors. And, just like other HALLOWELL Shop Equipment, your cabinet bench can be modified to satisfy changing requirements. Standard unit drawer tiers, shelves, sliding doors and other accessories are interchangeable and easily installed.

Let us tell you about *custom built* flexibility at *ready made* prices! Write today for descriptive literature. STANDARD PRESSED STEEL Co., Jenkintown 11, Pennsylvania.

HALLOWELL SHOP EQUIPMENT DIVISION

SPS
JENKINTOWN PENNSYLVANIA

WORK BENCHES • CABINET BENCHES • POSTURE STOOLS AND CHAIRS
FOREMAN'S DESKS • TOOL STANDS • HAND AND PLATFORM TRUCKS

....HERE'S PROOF OF EXPERT RESULTS BY AN INEXPERIENCED OPERATOR!

"A few years ago we saw an office girl use an Ansul Extinguisher in competition with an experienced fire-fighter who used another dry chemical fire extinguisher of approximately the same size. It was the girl's first attempt at fire fighting with any extinguisher. The stenographer extinguished a test fire in 4 or 5 seconds. The experienced fire-fighter exhausted his extinguisher in about 15 seconds with no put out fire."

The above is a true account of an actual experience viewed by witnesses. Remember Ansul is FIRST in Fire-Stopping effectiveness with inexperienced operators . . . and . . . YOUR BEST PROTECTION for flammable liquid, gas and electrical fires.

SEE PAGE 184

ATLAS FOR SMALL ORDERS FOR LARGE ORDERS FOR HARD-TO-DO-JOBS

OPERATIONS: Thread cutting and machining on automatics and hand-operated screw machines. Thread rolling, metal stampings, bending and spot welding. Facilities for secondary operations.

SPECIFICATIONS: For prompt quotations, submit your requirements giving details, specifications and delivery dates.

METALS: Steel, stainless steel, brass and alloy steels.

WRITE TO DEPT. F FOR

FREE CATALOG

OF STANDARD PRODUCTS

AT-104A

ATLAS SCREW & SPECIALTY CORP.

450 BROOME STREET, NEW YORK 13, N. Y.

MATERIALS HANDLING EQUIPMENT

Begins on page 146

Lightweight Tractor

Weighing only 990 pounds, the Truc-Tor will pull up to 13 times that amount in payload. This compact cargo-train tractor will help you meet load limitations of elevators, floors, and dock boards.

Maker says 5.8-hp. air-cooled engine will operate a full 8-hr. shift on approximately one gallon of gasoline.

The Knickerbocker Co., Truck-Man Div., 581 Liberty St., Jackson, Mich.

■

PORTABLE LOADING PLATFORM can be moved about on retractable casters. Platform is 4 feet square, has capacity of 1 to 3 tons, a lifting range up to 20 feet. Its' electrically operated, with either floor or platform control, can be handled by one man. Atlas Industrial Corp., 849 39th St., Brooklyn 32, N. Y.

■

ADJUSTABLE STAND with roller head supports bar stock and pipe being fed into punching and shearing machines. Unit comes with either straight or concave roller head. Height is adjusted through telescoping shaft and clamping screw. Made by the Samuel Olson Mfg. Co., 2424 Bloomingdale Ave., Chicago 47.

Turn the page

Customer Reports:

No Scrap Loss in Making Bushings of Asarco Continuous-Cast Bronze!

The Chain Belt Company of Milwaukee, manufacturer of famous "Rex" sprocket chains and construction machinery, finds that scrap loss is virtually eliminated . . . set-up and machining time cut drastically . . . by using Asarco Continuous-Cast bronzes in *exactly the length needed* for the machining of bushings. Chain Belt buys Asarco bronzes from the Badger Bearing Company (distributor) in Milwaukee to fabricate sprocket wheel bushings, and important parts of its Adjusta-Hite Moto Mixers.

Chain Belt also reports that the high tensile strength and uniform hardness of Asarco Continuous-Cast Bronze make this product far more suitable than ordinary bronze for applications in which resistance to hydraulic pressures is important.

Asarcon 773 (SAE 660) bearing-bronze is stocked by distributors all over the country. 216 sizes are available from warehouse stock in 105" lengths . . . tubular or solid round, in diameters from ½" to 5". The distributor will cut the bronze long or short to suit your requirements. Symmetrically shaped bars and tubes, special alloys and longer lengths up to 20' can be made to order.

Free illustrated catalog describing properties, sizes, weights, etc., is available on request.

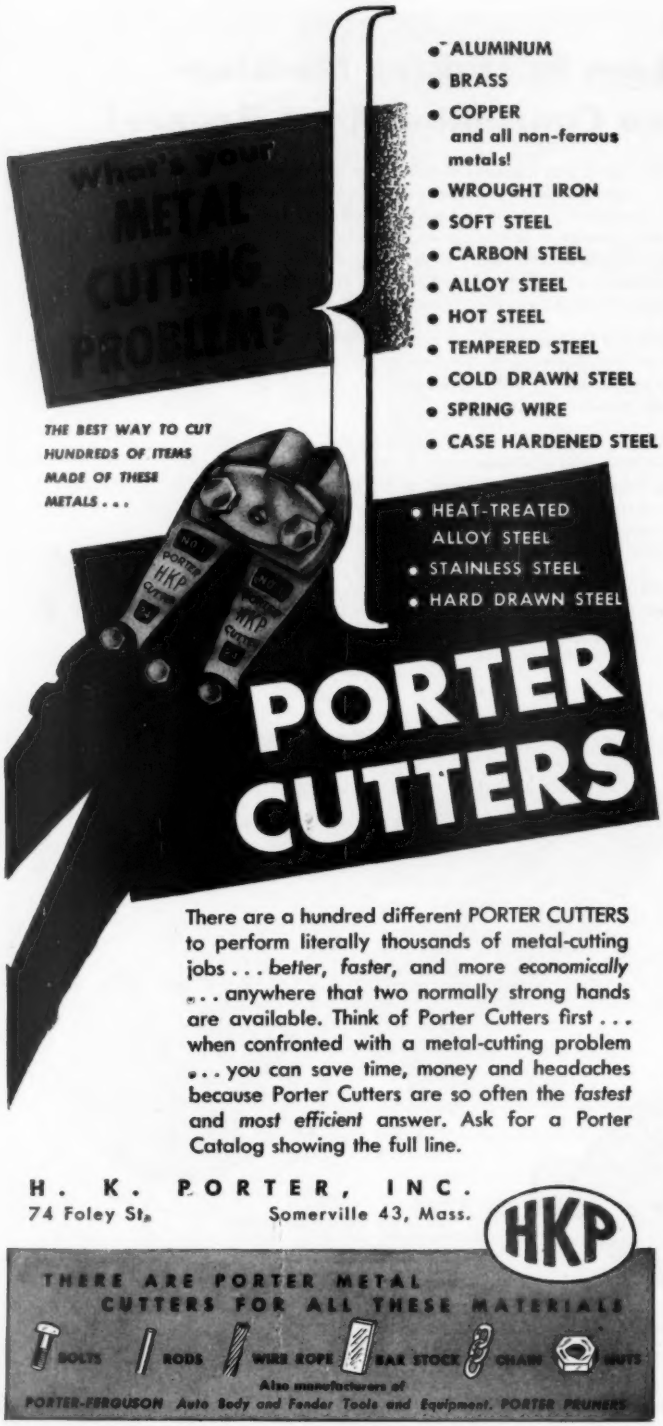
These photomicrographs demonstrate the superior dispersion of constituents in continuous-cast alloys . . . also their freedom from porosity and other metal faults. (Alloy of 75% Cu, 5% Sn, 20% Pb shown here).

ASARCO CONTINUOUS-CAST RODS · TUBES · SHAPES ®

West Coast Sales Agent:
KINGWELL BROS. LTD., 444 Natoma Street, San Francisco, Calif.

American Smelting and Refining Company

OFFICES: Perth Amboy Plant, Barber, New Jersey
Whiting, Indiana


What's your METAL CUTTING PROBLEM?
THE BEST WAY TO CUT HUNDREDS OF ITEMS MADE OF THESE METALS . . .
• ALUMINUM
• BRASS
• COPPER and all non-ferrous metals!
• WROUGHT IRON
• SOFT STEEL
• CARBON STEEL
• ALLOY STEEL
• HOT STEEL
• TEMPERED STEEL
• COLD DRAWN STEEL
• SPRING WIRE
• CASE HARDENED STEEL
• HEAT-TREATED ALLOY STEEL
• STAINLESS STEEL
• HARD DRAWN STEEL
PORTER CUTTERS
There are a hundred different PORTER CUTTERS to perform literally thousands of metal-cutting jobs . . . better, faster, and more economically . . . anywhere that two normally strong hands are available. Think of Porter Cutters first . . . when confronted with a metal-cutting problem . . . you can save time, money and headaches because Porter Cutters are so often the fastest and most efficient answer. Ask for a Porter Catalog showing the full line.
H. K. PORTER, INC.
74 Foley St. Somerville 43, Mass.
HKP
THERE ARE PORTER METAL CUTTERS FOR ALL THESE MATERIALS
BOLTS RODS WIRE ROPE BAR STOCK CHAIN NUTS
Also manufacturers of
PORTER-FERGUSON Auto Body and Fender Tools and Equipment. PORTER PRUNERS

MATERIALS HANDLING EQUIPMENT

Begins on page 146

Quick Connectors for Hoist Cables

You connect two Brummel hooks with a twist of the wrist, and disconnect them the same way. But once joined, says the maker, they won't come apart until intentionally disconnected.

The hooks have many applications in materials handling operations. They are ideal for quick connection on hoists, slings, and crane cables. You can also use them as safety hooks on power press harnesses, safety belts, and entrance guards.

The standard Brummel hook is made of corrosion-resistant manganese bronze. A lighter model is made of aluminum-base Ternalloy. You can get them in a wide range of types—fast or fixed eye hooks, swivel hooks, fixed jaw hooks, floor or platform fittings, bolt hooks, etc.

Brummel Hook Co., 1619 W. Winona St., Chicago 40.

■

TWO-PLANE PRESS CONVEYOR with rubber belt handles materials such as stamping slugs that can't be conveyed on metal belts. Two-plane design takes it back under presses, saves valuable work space. Portable unit has oil-resistant rubber belt. Loading end of belt is 8 inches from the floor. R. T. Sheehan Co., Plymouth, Mich.

Turn the page

Cash in Your Scrap!

When you buy TROLLEY CONVEYORS . . .

LINK-BELT GIVES YOU BOTH!

Superior components → plus engineering ingenuity

Effective sealing of wheel and bracket keeps out dust and dirt
Wheels are drop-forged and internally machined to extremely close tolerances
Raceways are induction hardened. High load capacity is based on entire assembly — not just on bearing
Rugged, one-piece bracket and clevis are drop-forged and heat-treated—fewer parts to maintain
Trolley can replace other makes without disturbing chain's operating position
Clevis pins are locked in bracket, cannot rotate. Bracket wear is minimized

At loading station, 100-lb. sacks are filled, stitched, fed onto pick-up rack and lifted automatically by two-finger carriers onto L-B multiplane trolley conveyor.

Sacks are carried overhead through warehouse to truck dock or any of seven railroad loading docks. Portable discharge chute permits unloading at any point. Bags drop on rollers to shoulder height.

Note four of the important advantages which you get with Link-Belt Overhead Trolley Conveyors—

Quick, direct flow, regardless of physical layout. Saving of floor space. Better working conditions. Synchronization with other conveyors.

Results like these are yours when you tap industry's greatest source of materials handling and power transmission experience. Your operating and maintenance costs are reduced with Link-Belt ball bearing trolleys.

Put Link-Belt engineering ingenuity and quality products to work for you. Our engineers will work with you or your consultants to help set up smooth, steady, profitable straight-line production in your plant.

LINK-BELT

OVERHEAD TROLLEY CONVEYORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,507-R

When you put the best available materials in your products you have no qualms about your reputation. That's why you will want to specify **DYNAPRENE** flexible cord . . . it is the best cord money can buy.

DYNAPRENE is long wearing and resistant to abrasion and the destructive effects of oils, greases, sunlight, alkalis and acids.

DYNAPRENE stands up longer under conditions that quickly destroy the usefulness of other types of cord.

DYNAPRENE flexible cords are jacketed with a specially developed Whitney Blake neoprene compound that is truly tough. These cords are made by the continuous vulcanizing process which assures accurate centering and uniformity of cure.

In **DYNAPRENE,** Whitney Blake has a quality product that will safeguard your reputation as well as theirs.

If you wish to test DYNAPRENE ask for a sample on your business stationery telling us the size and conductors required.

WELL BUILT WIRES SINCE 1899

WHITNEY BLAKE CO.

NEW HAVEN 14, CONNECTICUT

MEASURING & CONTROL

Office-Type Desk With Built-In Indicator

An operator seated at a new console desk can scan temperature readings from as many as 96 processing points. Minneapolis-Honeywell has taken an executive-type office desk, and set into it an ElectroniK precision indicator with appropriate switch banks and pushbutton assemblies.

The operator can log his 96 readings in almost as many seconds without walking the length of a long panel board. The 60-in.-wide steel desk has conventional drawers and desk-top space for writing.

Minneapolis-Honeywell Regulator Co., Brown Instruments Div., Wayne & Windrim Aves., Philadelphia 44.

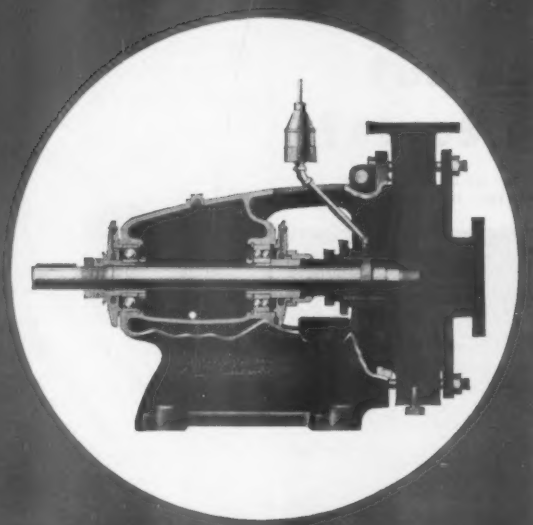
■

FLOW INDICATOR winks an eye when liquid line is full. Brass housing has a ceramic eye that magnifies when there's liquid in it. Simple device is installed easily, has a liquid-tight seal. It's an easy way to spot-check lines where liquid must be kept flowing. Allin Mfg. Co., 1153 W. Grand Ave., Chicago 22.

■

PRESSURE REGULATOR gives precision of air pressure in the 0 to 30-psi. range at air flows of from 0 to 2 cfm. The regulator operates on primary line pressures up to 400 psi. Unit is specially suited for use with air-controlled instruments, but can be adapted to any process requiring precision control of air, nitrogen, other inert gases. C. A. Norgren Co., 3421 S. Elati, Englewood, Colo.

Turn the page



THE SERIES R

FOR OWNERS OF SERIES M DURCOPUMPS:
Many parts of the Series R Durcopumps are interchangeable with the Series M. It is possible for owners of these older pumps to convert to the Series R, thus taking advantage of design improvements. Write for Bulletin P/2 on Conversion.

For acid handling:

THE NEW DURCOPUMPS PROVED IN ACTUAL SERVICE

DURCOPUMPS

In actual service for more than a year, the Series R Durcopumps incorporate the best features of the earlier Series M Pumps with design changes which have improved performance and reduced maintenance.

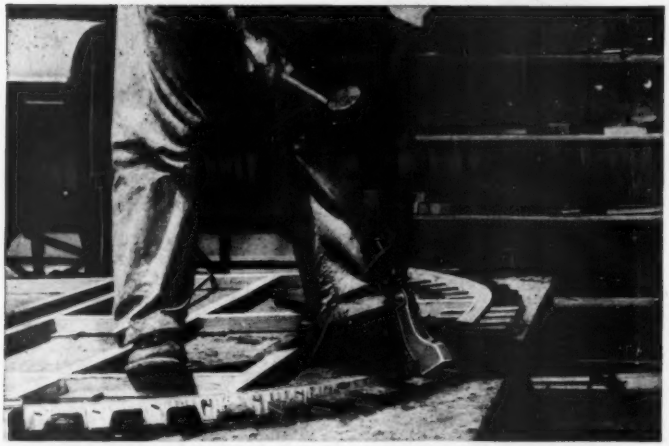
Wet ends, of course, are interchangeable for meeting changing conditions. Among other improvements are a better stuffing box design, through-bored frame for positive alignment, and a more rugged impeller and heavier shaft for better balance and longer life. All features of the Series R Durcopumps are discussed in Bulletin P/1.

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

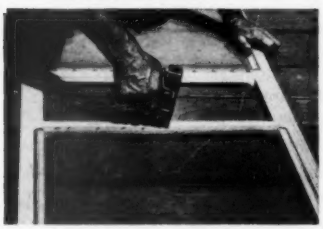
THE DURIRON COMPANY, INC.
Dayton, Ohio

Where can you cut your fastening costs?

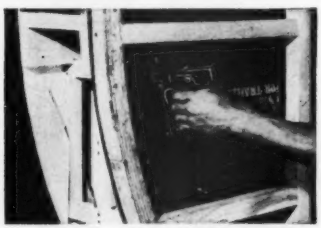
SEE HOW THIS LEADING MANUFACTURER OF HOUSE TRAILERS CUT COSTS UP TO 30% ON FOUR DIFFERENT OPERATIONS



1. FASTENING LAMINATED PLYWOOD BOWS of trailer frames with Bostitch staples holds them firmly in place while glue sets. Bostitch H4 self-feeding hammers, used on this job with rubber mallets, do the work *3 times faster and 30% lower in cost* than hand nailing. It's easy to see why. One blow per staple. No slow placing of nails. No misses. Less worker fatigue. You, too, may find that Bostitch stapling hammers or machines can cut your costs of fastening wood, light metal, paper, leather, rubber or plastics.



2. ASSEMBLING SCREEN DOORS with Bostitch T5 stapling tackers is *twice as fast as hand tacking*, reports this same trailer manufacturer. The reason is clear. One-hand, finger-squeeze operation is quick, easy and accurate . . . leaves other hand free for holding the work.



3. APPLYING INSULATION to the trailer walls is also done better and faster with Bostitch T5 tackers. Builders enjoy the same benefits.

4. ATTACHING GIMP to the trailer frames is also easy with Bostitch T5 tackers. Staples can be accurately placed within 1/16" of edges.

GET MORE COST-CUTTING FACTS . . . MAIL THIS COUPON TODAY!

BOSTITCH, 410 Mechanic Street, Westerly, R. I.

Please rush me free literature showing which Bostitch stapling machines selected from your more than 800 models can help me do better, faster fastening. The materials I fasten most are:

Wood ☐ Paper ☐ Rubber ☐ Plastics ☐ Fabrics ☐ Leather ☐ Light Metals ☐

BOSTITCH®
fastens it better AND FASTER with wire

ALL TYPES OF MACHINES FOR APPLYING STAPLES

ALL TYPES OF STAPLES APPLIED BY MACHINES

Name..... Title.....

Firm.....

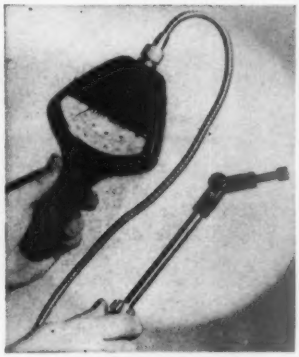
Street.....

City..... Zone..... State.....

300 Bostitch field men in 112 cities in the United States and 11 cities in Canada offer you nearby service.

MEASURING & CONTROL EQUIPMENT

Begins on page 158



Hand Pyrometer With Two Ranges

Where temperature detectors are not installed permanently, you can use this versatile hand pyrometer. With it, you can take surface, liquid, gas, and molten-metal measurements.

Two scale ranges—0-500 F. and 0-1500F. — can be selected by flicking a switch. You get three interchangeable tips — a surface tip, an immersion tip for liquids and molten metals, and a 2-prong contact tip.

Scales are direct reading. And automatic cold-junction compensation cancels out the effect of changes in ambient temperature.

General Electric Co., Schenectady 5, New York.

■

Timer Controls Independent Work Cycles

One "timed operations preselector" can control two or more process cycles independently of one another. You can change the time sequence of any one cycle without affecting any of the others.

There's only one timing motor. This motor delivers a fixed-interval time impulse. By means of pushbuttons you can select a different multiple of this time impulse to control each operation. There's an independent row of

This Tiny Tap Tells a Big Turning Story

This tiny part portrays better than words the extreme accuracy you can expect from a Monarch 10" Model EE Precision Toolmaker's Lathe. The operation detailed below was actually performed on a standard lathe which is employed primarily to turn a variety of parts for small, precision, automatic tapping and drilling machines for the user's own manufacturing operations. These master taps which he chases occasionally are needed to make a master die. This, in turn, is used to produce working taps in quantity. End use is tapping a hole in the end of surgical needles to permit holding of the suture.

How surgeons thread the needles, we'll never know. We do know that in all probability you'll never have to work as fine as 200 threads per inch. But accuracy like this can be just as important to you, regardless. With the Monarch 10" Model EE, as a look at the listed features will at once reveal, you get a machine unequaled for precision, speed and sensitivity. Like most of the Monarch line of lathes, it can be furnished with "Air-Gage Tracer" controls . . .

The Monarch Machine Tool Company, Sidney, Ohio.

Surgical needle master tap—overall length, ¾"—diameter, .0218"—threads per inch, 200—thread accuracy, lead within .0001 over the entire threaded length of ⅜".

**MONARCH 10"
MODEL EE FEATURES**

- All electric drive direct to spindle through multiple "V" belts. No gears in headstock.
- A true high speed lathe for small work. Available with speed range up to 40 to 4000 R.P.M.
- Totally enclosed, automatically lubricated end gearing and gear box.
- Flame hardened and ground ways for both carriage and tailstock. Bed all in one piece—no inserts.
- American standard Camlock spindle nose—for quick, rigid and accurate chuck and fixture mounting.
- Easy, fatigue-free operation. Base design permits operator to work close comfortably. He gets production—not backaches.
- Over 6000 10" Model EE machines in use.
- The only small lathe available with anti-friction bearing taper attachment.
- For thread chasing up to 100% faster, has exclusive combination of electric lead-screw reverse and variable reverse speed control.

Monarch
TURNING MACHINES

ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

Gentlemen:
Please send me without obligation your complete illustrated Booklet #302, covering the 10" Model EE Monarch Sensitive Precision Toolmaker's Lathe.

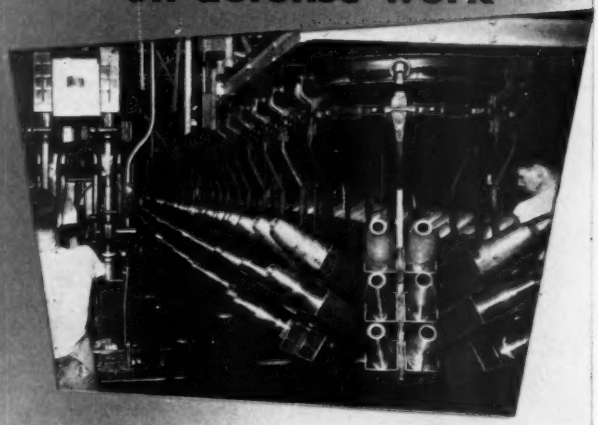
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

First Aid for MANPOWER PROBLEMS on defense work



While there is far more satisfaction in developing civilian production, the present emergency leaves no alternative but to concentrate on war plant operations now. In this field MHS engineers have an abundance of experience and know-how.

No other organization had the opportunity to design and build more engineered handling systems in defense plants during the last war.

No other organization has ever installed as large a handling system for the loading of artillery shells.

For 3 years MHS carried on the mass production of aerial bombs and navy anchor chain in a plant designed, erected, equipped and operated by Mechanical Handling Systems, Inc. Production records set there were unequalled anywhere else.

The record further shows that MHS engineers promoted the idea and built the first conveyor system ever used for the progressive assembly of aircraft. And there were many more such projects during the war years which might be cited.

If you are getting ready for defense work our experience in this field may save you valuable time and considerable expense. Feel free to call on us for suggestions.

Mechanical Handling Systems, Inc.

4608 NANCY AVE. • DETROIT 12, MICH.

Offices in Principal Cities

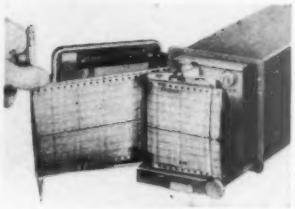
MHS

pushbuttons for each process cycle.

Maker says there's no limit to the number of cycles, the length of time sequence, or the number of circuits that can be handled.

The Henry G. Dietz Co., 12-16 Astoria Blvd., Long Island City 2, N. Y.

■



Miniature Strip Chart Recorder

This compact electronic recorder has several features that make it a versatile performer. Plug-in connections make it easy to remove the unit from its circuit. The pen is electronically actuated, independent of the chart drive. So without recalibration you can interchange this recorder in circuits controlling temperature, pressure, level, or flow.

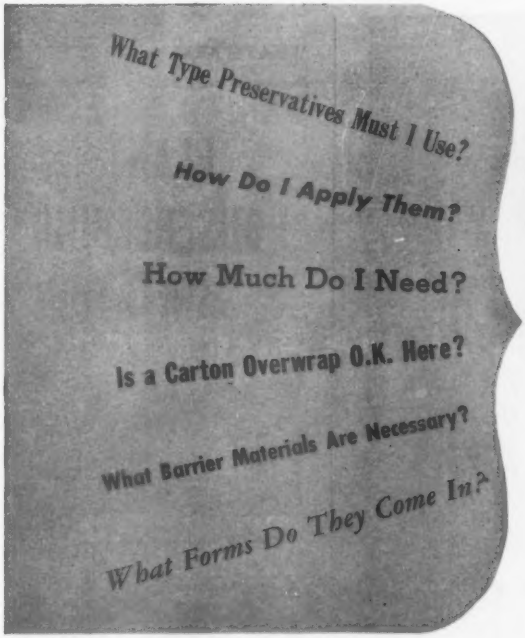
And you can pull the recording mechanism out about 3 inches from its case without stopping the recorder. This permits inspection of past records, and re-inking of the pen without interrupting the trace.

The Autronic recorder is a servo-powered null-balance device. Three hours of record are visible through the glass-windowed door. Standard speed of the 3-in.-wide chart is 1 inch per hour. Recorder comes with a 30-day chart.

The Swartwout Co., 18511 Euclid Ave., Cleveland 12.

Turn the page

Cash in Your Scrap!


What Type Preservatives Must I Use?
How Do I Apply Them?
How Much Do I Need?
Is a Carton Overwrap O.K. Here?
What Barrier Materials Are Necessary?
What Forms Do They Come In?

questions about packaging?

Dearborn has the materials . . . knows the methods

If you have a government contract and need assistance in packaging your products to government specifications, see your Dearborn packaging engineer.

Dearborn supplies all the government specified materials, including rust preventives, wrappers and sealers, case liners, fingerprint neutralizers. **But, more important to you, Dearborn packaging engineers will visit your plant, plan your packaging procedures to insure your products against the threat of corrosion.**

This is a service that is available to any manufacturer with a packaging problem—and particularly designed for you with government contracts for export shipment. The coupon is for your convenience.

This booklet will help you

The new edition of "Preventing Corrosion in Export Packaging" gives you: (1) current government specifications; (2) cleaning methods; (3) approved packaging methods; (4) how to apply rust preventives; (5) how to wrap, seal and dip parts; and (6) other valuable information with step-by-step picture stories. Write for it today.

DEARBORN CHEMICAL COMPANY
Merchandise Mart Plaza • Chicago 54, Illinois

Dearborn Chemical Company, Dept. F
Merchandise Mart Plaza, Chicago 54, Ill.

☐ Please send a copy of "Preventing Corrosion."

☐ Have a Dearborn Packaging Engineer call.

Name.....

Company.....

Title.....

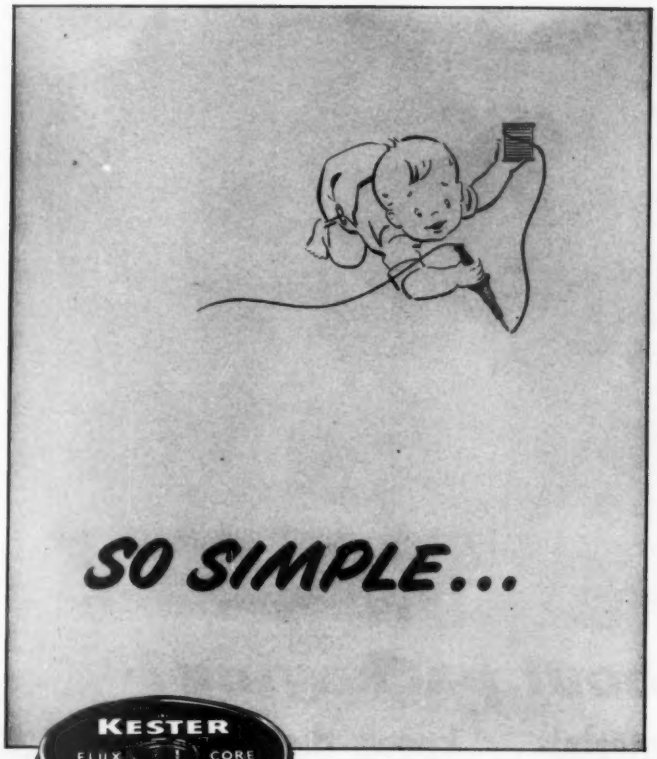
Address.....

City.....*State*.....

Dearborn
Reg. U. S. Pat. Off.

NO-OX-ID
IRON + = RUST

THE ORIGINAL RUST PREVENTIVE



KESTER FLUX-CORE SOLDER

SO SIMPLE **to leave your soldering troubles to Kester**

Kester alone can provide that *engineered* Flux-Core Solder so essential to efficient operation.

This is possible because only Kester possesses that necessary flexibility of flux control (different core sizes), just the right amount of flux needed, in the many diameters that range from .009″ to ¼-inch.

Technical Laboratories and Field Engineering Service adapt these features to specific requirements.

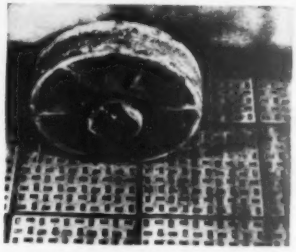
KESTER SOLDER COMPANY
4213 Wrightwood Ave., Chicago 39
Newark 5, New Jersey • Brantford, Canada

KESTER SOLDER

WHAT'S NEW IN EQUIPMENT
Begins on page 122

PLANT HOUSEKEEPING & SANITATION

Steelplate is a handy way . . .



. . . to reinforce concrete floors.

Steel Adds Backbone to Plant Flooring

Concrete flooring that gets a tough going over from industrial trucks can be given a new life with Floor Plates. They give your plant floor the steel surface that can take plenty of abuse. You can install them on concrete flooring —old or new.

Each Floor Plate has 100 small rectangular holes and 100 barbed prongs ¾ inch long. On existing plant floors these plates are pressed into a concrete topping mix. The barbed prongs anchor the plate to the concrete firmly. Floor plate has no sharp edges, and the maker says it can't work loose.

Plates are designed to fill one-foot increments of floor area. This

THIS man is a Pitt Chem corrosion engineer. His job is an important one—to show maintenance engineers how to add years of life to hard-to-replace equipment with Pitt Chem Tar Base Coatings.

These versatile coatings are derived from coal tar pitch, one of our most impervious materials. They're low in cost, easy to apply, and their heavy film—up to ten times as thick as ordinary paint—provides an impenetrable barrier to most mineral acids, alkalis, corrosive vapors and atmospheric conditions.

You can depend on Pitt Chem Tar Base Coatings for top uniform quality because we control every phase of production from coal to finished coating. That's your assurance of top-grade application characteristics, uniform bond and maximum protection. ● More information, or field application assistance will gladly be sent on request.

PITT CHEM 101
A versatile, heavy duty coating that withstands severest corrosive conditions.

PITT CHEM 102
A thin, high gloss maintenance coating for steel and concrete surfaces.

PITT CHEM 103
A heavy duty coating for metal exposed to corrosive vapors, dilute acids and alkalis.

PITT CHEM 104
A fast drying, high gloss coating for equipment handling potable water.

W&D 4120

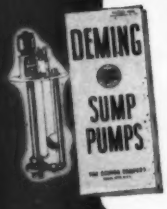
PITTSBURGH COKE & CHEMICAL CO.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

These sump pumps embody the latest and most modern developments such as:

- Positive alignment of all rotating and guide bearing parts
- Flanged column pipe connections
- Motor mounting for standard NEMA type "C" flange
- Adjustable semi-open type impeller
- Heavy duty construction
- Discharge sizes 1 to 10 in. pipe
- Capacities up to 3000 G.P.M.
- Discharge heads up to 140 feet
- Lengths up to 21 feet
- Motor horsepower up to 75 HP.

Send for DEMING SUMP PUMP Bulletin



THE DEMING COMPANY
530 Broadway, Salem, Ohio
Send copy of illustrated Bulletin No. 4600-A on Deming Sump Pumps.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Begins on page 164

simplifies the job of fitting them around posts and machinery. Concrete exposed through the holes in Floor Plate provides resistance to slipping that would be missing on an all-steel floor.

Acme Steel Co., 2840 Archer Ave., Chicago 8.

■

Plastic Coating Cuts Spray Booth Maintenance

With Vincote the maintenance of spray booths is a simple, rapid operation. Vincote is a vinyl-type plastic paint for spraying on side walls of both water-wash and dry paint spray booths. It dries rapidly to a tough plastic film with high tensile strength. The protective film is impervious to paint, enamel, lacquer, and water.

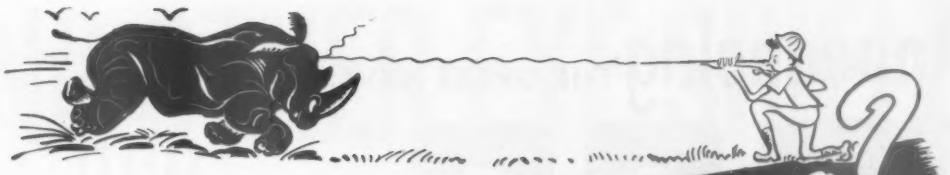
When excessive paint spray begins to build up on booth walls, clean-up becomes a simple job. You just strip the Vincote film off, and spray on a clean layer.

Detrex Corp., 14331 Woodrow Wilson St., Detroit.

■

WATER PICK-UP MACHINE will wet-vacuum large areas of water-covered floors. Unit made by the American Floor Surfacing Machine Co., 518 S. St. Clair St., Toledo 3, sucks up suds and dirty water, leaves a dry path 29 inches wide.

Turn the page



A "22" FOR A RHINO?

. . . no, No, NO — it takes something special to stop big game. BAY STATE has developed 3 special ways to "stop" your segmental grinding problems—big or small.

FRACTIONAL GRADES:
Where a whole grade change would be too great, BAY STATE splits a normal grade into 3 degrees of hardness.

KOOLPORE SPECIFICATIONS:
Where faster production is required without burning expensive tools, etc., BAY STATE manufactures segments with special induced pores.

ENGINEERING:
Where grinding problems are really tough, BAY STATE research has the answers. The answer for you may be a special grain combination — such as the popular BAY STATE "8A".

Ask for our "on-the-job" engineering service today.

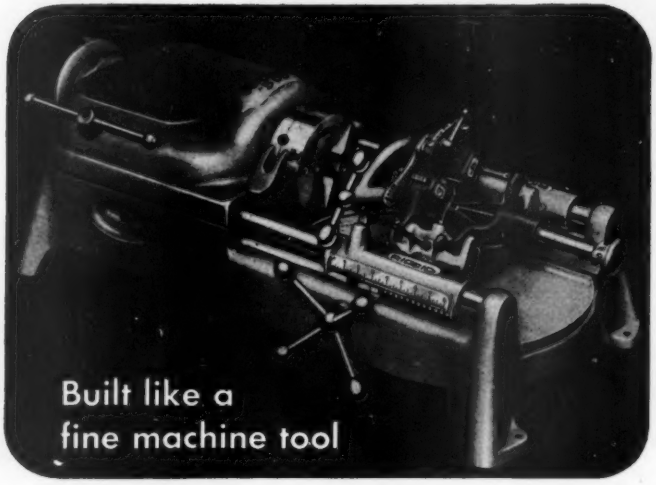
BAY STATE

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Mass.
Branch Offices and Warehouses —
Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd.
Brantford, Ontario

BAY STATE'S current expansion program includes a new 250 foot kiln plus a 30% increase in plant capacity . . . this means better deliveries to you.

Announcing THE GREAT NEW "500"

PIPE & BOLT THREADING MACHINE



Full of typical RIDGID Improvements

- Range ⅛" to 2" pipe; ¼" to 2" bolts.
- Cutting, threading and reaming tools operate independently and right up to chuck, swing up out of way when not in use.
- New RIDGID quick-opening quadritype, dualtype and monotype die heads save time and work.
- Concealed oil system, reversible pump, no priming.
- More than 20 other efficiency improvements—see this remarkable new RIDGID "500" at your Supply House!

THE RIDGE TOOL CO. • ELYRIA, OHIO

★★★ RIDGID Work-Saver Pipe Tools ★★★

Begins on page 122

SAFETY

Comfortable Faceshield

Greater worker comfort and freedom of movement was the goal of this faceshield. The MSA chest-mounted shield doesn't rest on the workers head; it's supported by adjustable neck and chest straps. The visor can easily be adjusted by the worker to the most comfortable angle, height, and distance for the job.

Maker claims improved vision, elimination of dead air space, and relief from binding discomforts. Women workers should quickly see that this type of shield also eliminates the problem of mussed hair-dos.

Mine Safety Appliances Co., Braddock, Thomas, and Meade Sts., Pittsburgh 8, Pa.

■

5-LB. DRY CHEMICAL EXTINGUISHER is a portable unit that can be recharged in the field. After discharge, you pour another five pounds of dry chemical into the powder chamber, then recharge with 150 pounds of compressed air. Unit is effective against flammable liquid and electrical fires, says Walter Kidde & Co., 40 E. 34th St., New York 16.

Turn the page

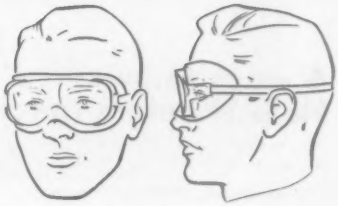
NO OTHER EYE SHIELD

BAL-guard's crystal-clear one-piece acetate lens can be replaced in a matter of seconds. Lens is snapped in or out of place. Cannot be jarred loose.

Another unique feature is BAL-guard's 2-way indirect ventilation insuring a minimum of fogging, greater efficiency.

GIVES YOU ALL THIS!

No other all-plastic coverall eye shield on the market can meet the all-in-one performance tests of BAL-guard. Each function of an ideal all-plastic coverall was researched exhaustively, then incorporated in its design—protection, ease of use, comfort, economy. BAL-guard exceeds U.S. Bureau of Standards requirements for protection against impact, guards against dust and splash. Many BAL-guard features are exclusive—features not attainable, even singly, in any other make. Combined in BAL-guard, they meet an infinite demand for high-quality, flexible protection at low cost. Available with clear or transparent green lenses; clear, green or opaque frames, BAL-guard may well be the answer to a number of eye safety problems in *your* plant. Ask your Bausch & Lomb distributor for a sample, or write direct to Bausch & Lomb Optical Co., 90104 Smith St., Rochester, New York.



BAL-guard is molded to fit any average face comfortably. It may be worn over regular glasses, or over corrective safety lenses mounted in acetate or metal spectacle-type frames.

The brand new Bausch & Lomb

BAL-guard ALL-PLASTIC EYE SHIELD

Cut Your Production Costs with "SUPER" Hole-Shooters

Photograph, courtesy of Harnischfeger Corporation, Milwaukee, Wisconsin — reaming holes, with a ⅞" Milwaukee "SUPER" Hole-Shooter, for gear-case on the P. & H. 6-cubic-yard Electric Excavator.

6 ways Milwaukee "SUPER" Hole-Shooters lower costs

. . . equipped with "Milwaukee-Built" motors; DC, or AC up to 60 cycles — 115, 150, 230 or 250 volts

1. HIGHER LOAD SPEEDS in continuous use.
2. FOUR TIMES the customary air-cooling volume.
3. MORE HOURS of service-free drilling.
4. LIFETIME LUBRICATION of ball and roller bearings.
5. UNEQUALLED electrical efficiency.
6. VIBRATION-FREE armatures.

4 SIZES
½" — ⅝"
¾" — ⅞"

WRITE FOR COMPLETE INFORMATION — FOLDER "D-1"

MILWAUKEE ELECTRIC TOOL CORPORATION
5346 W. State Street, Milwaukee 8, Wis.
Canadian Distributor: MATTHEW MOODY & SONS CO., 740 Inspector St., Montreal

Milwaukee PORTABLE ELECTRIC TOOLS
Famous for "MORE MOTOR GUTS"

VALVES, PIPING & ACCESSORIES

Threaded Clay Pipe

Now you can screw together ceramic pipe, just as you would ordinary metal piping. The Robinson Clay people are producing pipe with a threaded plastic section cast onto each end. Each of these end joints has tapered male thread. Two sections of the clay pipe are joined together with a female-threaded collar.

The resulting joint is leakproof, and resistant to most corrosive acids and gases. The rubber-like plastic used in the joint gives it a great degree of flexibility. Piping can be deflected as much as six degrees without leakage, says the maker. Screw-Seal piping comes in 4-, 6-, and 8-in. internal diameters.

Robinson Clay Products Co., 65 W. State St., Akron, Ohio.

■

PIPE HANGER newly designed by the Bergen Pipesupport Corp., 50 Church St., New York 7, is said to give constant support to piping subject to large vertical as well as longitudinal movement. The new hanger is permanently lubricated, has a minimum of moving parts, and is practically maintenance-free, claims the maker.

Turn the page

ALL-PURPOSE SLINGS

Roebling Slings with Tapered Sleeve Splice come to you ready for the job

THERE'S NO MORE "splicing your own" when you buy Roebling All-Purpose Slings with the Tapered Sleeve Splice. These slings have the full strength of the rope itself.

All-Purpose Slings are made of Roebling Preformed "Blue Center" Steel Wire Rope with independent wire rope core. They're *really* tough, yet flexible and easy to handle. They're made in all standard lengths and sizes.

Write for folder on All-Purpose Slings with Tapered Sleeve Splice, and for the "Sling Data Book" describing the full Roebling sling line. John A. Roebling's Sons Company, Trenton 2, New Jersey.

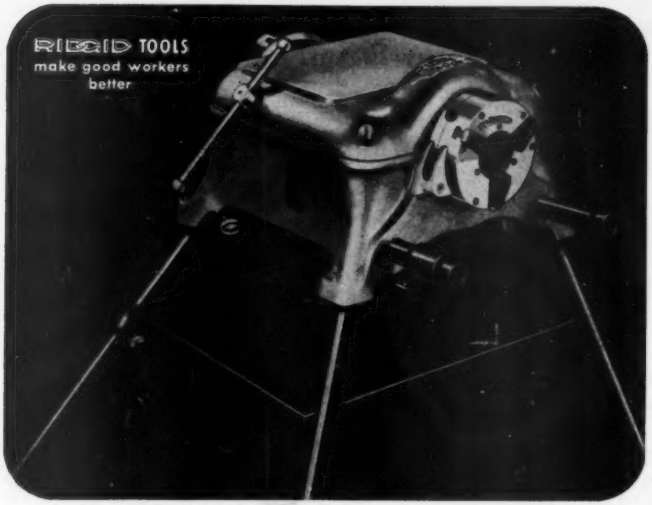
ROEBLING

ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 701 ST. CLAIR AVE., N. E. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

WHY SKILLED PIPE FITTERS Demand

RIDGID

"400" PORTABLE POWER DRIVE



RIDGID "400"—*bench model or stand with tray, capacity ⅛" to 2"—to 12" with geared tools.*

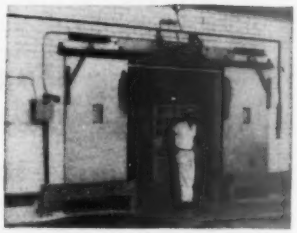
Time-and-work-saving power for hand threaders, cutters, reamers

- ★ Extra light-weight unit—one man can handle it.
- ★ Lots of power—universal motor, forward, reverse, won't bog down on large pipe.
- ★ RIDGID design 3-jaw chuck, chuck wrench ejector; self-centering workholder in rear turns with pipe.
- ★ Sealed-in lubrication—no oil to spill.
- ★ See the remarkable "400" at your Supply House!

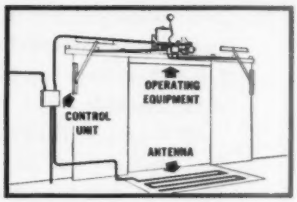
THE RIDGE TOOL COMPANY • ELYRIA, OHIO

★★★ RIDGID Work-Saver Pipe Tools ★★★

MISCELLANEOUS



It isn't magic that opens doors . . .



. . . a floor antenna does the trick.

Automatic Door Opener Uses Electric Field

Here's an automatic door operator that leaves your doorway and its approaches completely unobstructed. The actuating mechanism—an electric antenna—is set under the doorway, out of the way. There are no electric eye stanchions or uprights to get in the way of plant trucks.

The antenna creates an electric field around the door. When the field is broken by a person or truck, the door opens automatically. The door remains open till the object is safely out of the electric field, then closes. Opening and closing are controlled by air pressure. You can adjust timing as required.

Maker points to low-maintenance operation, low cost, and ease of installation. The NP Electro-Field operator is said to cost less than conventional photoelectric-eye door-operators. The unit

An old 200-KW generator requires a 12"-wide silent chain drive (encased, above). When new *300-KW* generator was added, the local Morse Distributor and Morse engineers were called in on job. They recommended a narrow 6"-wide Hy-Vo Drive. Results: Savings in first cost and subsequent operating costs. Space savings. And completely dependable power transmission.

What your local MORSE DISTRIBUTOR can do for you

Among other fine Morse products, he can supply you with the amazing Morse Hy-Vo Drive to transmit more horsepower at higher speeds and lower cost than any conventional drive you can buy. Capacities up to 5000 HP. Rotative speeds up to 3600 RPM. Linear velocities up to 6500 FPM. Here is power transmission at its best —smooth, efficient, economical.

With a Hy-Vo Drive, you can get more horsepower from smaller, less-expensive high-speed motors or engines. Or you can replace a cumbersome conventional drive and its expensive outboard mountings. Narrow, lightweight, long-lived Morse Hy-Vo Drives give you important savings in first cost and operating cost.

Yet Hy-Vo is only one of a fine line of power transmission products your Morse Distributor can supply. The quality-built Morse line includes Morse Morflex Flexible Couplings, Morse Roller Chain and Silent Chain Drives, Morse Stock Sprockets, Morse Drive Shafts, Morse Chain Couplings, and Morse Clutches. In addition, your Morse Distributor can bring top-flight engineering help to bear on your most stubborn power transmission problems.

For a competitive edge in your plant production, check into Morse Power Transmission Products. Call, see, or write your nearest Morse Distributor for information on the applications you have in mind. Look under "Chains" or "Power Transmission" in phone directory's yellow pages.

M=PT Morse means Power Transmission

MORSE CHAIN COMPANY • Dept. 302 • 7601 Central Ave. • Detroit 10, Michigan

MORSE
MECHANICAL POWER TRANSMISSION PRODUCTS

Now Available...the NEW

MOBILIFT

3500 Pounder

Lev-R-Matic DRIVE

Fork Lift Truck

Created to meet a demand!

...This is the Stand-Up Model "H-W" that MOBILIFT engineers developed to meet specific needs in all types of industry to help speed production and cut handling costs!

Not a single maneuverability feature or MOBILIFT advantage found in smaller models has been sacrificed in this new versatile "H-W" 3,500-lb. or "H" 3,000-lb. capacity truck.

Illustrated:
Model "H-W" with 83" Mast.
Also available with Standard 63" Mast.
Model "H" 3,000-lb. cap. available with 63" and 83" Masts.

CHECK THESE EXCLUSIVE FEATURES

- **LEV-R-MATIC CONTROLS** 2-way PUSH-PULL levers perform all jobs—Forward-Back, Elevating, Tilting. NO GEARS TO SHIFT
- **MOBIL-CHAIN LIFT** Roller chain operated uprights allow unobstructed forward view
- **MOBILIFT AIR COOLED 3-CYLINDER ENGINE** This heavy duty engine was designed and manufactured for exclusive use in MOBILIFT Fork Lift Trucks

Stand-Up Model "H-W" 3,500-lb. cap. on 15" load center. Mast ht. 83" (Free Lift 56"; lift ht. 108"; mast ht. extended 136"). Outside turning radius 63⅞"; inside turning radius ZERO

WRITE TODAY
for complete specifications on the new "H" series and other MOBILIFTS.

MOBILIFT Lev-R-Matic DRIVE

MOBILIFT CORPORATION

835 S. E. MAIN ST., PORTLAND 14, OREGON
2317 W. 18th, CHICAGO • 790 Patterson Ave., E. RUTHERFORD, N. J.
1113 Spring St. N. W., ATLANTA • 2724 Taylor St., DALLAS
2730 San Pablo Ave., BERKELEY

comes pre-piped and pre-wired ready to install.

National Pneumatic Co., 125 Amory St., Boston 19.

■

Telescriber Now Writes on Printed Forms

This new TelAutograph receiver not only transmits written messages to remote centers—it delivers them on printed forms that are part of your accounting or control systems.

It's still the basic TelAutograph system—a transmitter on which the sender writes his message, one or more receivers on which copies of this message appear simultaneously.

But use of printed forms instead of blank paper permits you to integrate this communication device right into your maintenance and production paperwork. And when the man in the shop jots down a hasty work order, there's less chance for errors of misunderstanding when he's filling in a printed form.

TelAutograph Corp., 16 W. 61st St., New York 23.

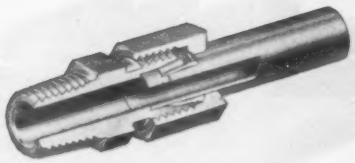
■

Industrial Oxygen Made in the Plant

If you use oxygen at the rate of 150,000 cubic feet or more, monthly, it may be cheaper to make your own. For that's the point at which the Joy people feel their new in-plant O_2 gen-

WANT HYDRAULIC CONNECTIONS-FAST?

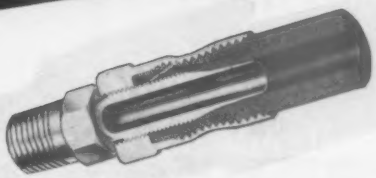
TIME-SAVING TWINS



ERMETO®

Saves up to 60% of installation time on steel tubing installations—up to 40% on copper and aluminum. You can make tube connections at all pressures with only a wrench—no special tools required.

Quick! Safe! Economical!



ALL-STEEL

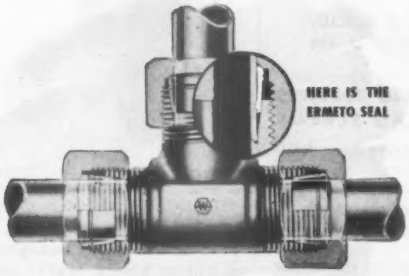
REUSABLE HOSE ENDS

AND INDUSTRIAL HOSE

Permit quick make-up of flexible lines from stock. Any length—whether low pressure or high—installation of hose assemblies with REUSABLE hose ends is quick and easy with ordinary bench tools.

Saves time—saves inventory.

HERE'S HOW ERMETO WORKS



No flaring, no threading, no welding, no soldering! Ermeto nut presses sleeve as threads engage. The forces acting on the sleeve cause it to bow slightly and actually bite into the surface of the tube. This strengthens the seal (see enlarged section, above), distributes vibration strains and holds a constant tension between the body and nut, to prevent loosening. Disassembly and retightening are easy—the sleeve remains in place, assuring a pressure-tight joint. Ermeto fittings meet J. I. C. requirements.

ASK FOR FULL INFORMATION

ERMETO—catalog No. E-1457A contains complete details on all sizes available in steel and stainless steel.

REUSABLE HOSE ENDS AND HOSE—catalog No. H-1451A lists complete range of hose sizes and pressures available for use in general industry.

Address: Dept. B, The Weatherhead Company, 300 East 131st Street, Cleveland 8, Ohio. In Canada, The Weatherhead Company of Canada, Ltd., St. Thomas, Ont.

Weatherhead Industrial Warehouse Distributors in all principal cities.

The Mark of Quality

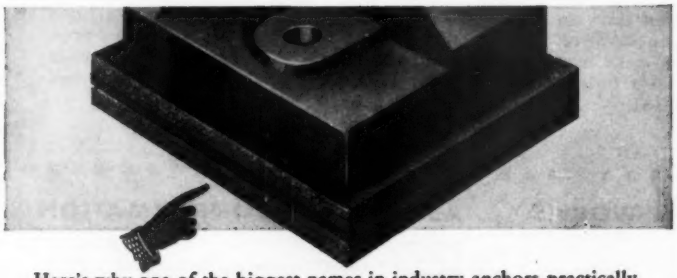
WEATHERHEAD

FIRST IN HYDRAULIC CONNECTIONS

Minneapolis-
Honeywell
Mounts Machinery
on

UNISORB®

...drilling avoided...floors saved!



Here's why one of the biggest names in industry anchors practically every kind of machine on floors of every construction in the modern way . . . *on UNISORB!*

TRANSMITTED MACHINE NOISE and VIBRATION REDUCED 60% to 85%

Lowers machine and building maintenance costs

Higher speed machine operation often possible

UNISORB ANCHORING REQUIRES NO BOLTS, NO LAG SCREWS

Old-fashioned, destructive floor drilling eliminated

Saves installation time as much as 80%. Labor costs reduced

Maintenance on machine mounting practically eliminated

Clip this coupon, or write us on your letterhead today . . .

THE FELTERS COMPANY

210-A SOUTH STREET, BOSTON 11, MASS.

Offices: New York, Philadelphia, Chicago, Detroit, St. Louis
Sales Representative: San Francisco
Mills: Johnson City, New York; Millbury, Mass.; Jackson, Mich.; New York City

Makers of FELTS **in all colors, thicknesses, consistencies, qualities . . . for all purposes. Rolls, strips, sheets and precision cut felt parts.**

Gentlemen: Please send free copy of new booklet "Why It Pays to Anchor Your Machines with UNISORB."

NAME..... TITLE .....

COMPANY NAME.....

STREET .....

CITY..... STATE.....

MISCELLANEOUS EQUIPMENT

Begins on page 172

erators can compete with purchased oxygen.

The new Joy units will turn out gaseous oxygen, 99.5% pure or better, at a cost of 5¢ to 10¢ per 100 cubic feet. Add amortization costs, and the total cost is still below the price of purchased oxygen, claims Joy.

Joy's semiportable generators should find a market among metal fabricators, chemical and process industries, other good-size users of industrial O_2. Plans now are for four models—generating ½, 2, 6, and 12 tons daily. Prices will probably range from $20,000 to $175,000.

Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22.

■

Scoop Truck

This all-hydraulic Scoopmobile has ¾-cubic-yard scoop, 4000-lb. capacity, and discharge height of 8 feet. Maker says it's a versatile, highly maneuverable front-end loader for handling sand, coal, chemicals, similar bulk materials. A skilled operator can handle up to 120 cubic yards of bulk an hour with the Model H. Attachments include hopper, forks, and crane boom.

Mixermobile Manufacturers, 9027 N.E. Killingsworth St., Portland, Ore.

Turn to page 311

Here's Food for Thought from...

Hotpoint Commercial Cooking

In-Plant Feeding Builds Better Employee Relations!

REQUIRED READING IF YOU EMPLOY 100 WORKERS OR MORE!

NEW, FACTUAL BOOK

by Food Service Expert, C. W. Schroeder

TELLS YOU HOW IT IS DONE!

NEARLY HALF of all labor officials queried in a recent survey* rated *good food, reasonably priced, the most important single factor in maintaining good employee relations*—the key to better-than-average production!

This new book by C. W. Schroeder, nationally known food service authority, shows you how to use good food best in your employee relations, production building program.

Written in clear, concise terms, it gives you step-by-step, no-nonsense facts . . .

. . . *What In-Plant Feeding Is, How to Use It.*
. . . *How to Establish a Food Service Policy.*
. . . *How to Cut Food Preparation Costs.*
. . . *How to Choose Equipment for Greatest Economy.*

Thousands of plants today produce more, millions of workers work better because of the principles outlined in this book. Request your copy of "IN-PLANT FEEDING, Newest Production Tool for Industry" today. Sent to you without cost or obligation as a contribution to greater industrial efficiency from Hotpoint.

*Industrial Relations Yearbook, 1951

Hotpoint Commercial Cooking

Hotpoint Inc. A General Electric Affiliate

LEADER IN COMMERCIAL ELECTRIC COOKING FOR 40 YEARS!

Hotpoint Inc. Commercial Equipment Dept.
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Announcement

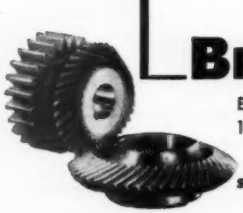
Brad Foote Gear Works, Inc.,
1309 South Cicero Ave. Cicero 50, Illinois
has purchased and will operate
as its subsidiary the

PITTSBURGH GEAR COMPANY

27th & Smallman Streets
PITTSBURGH 22, PA.

- For more than thirty years, the **PITTSBURGH GEAR COMPANY** has designed and manufactured gears chiefly for the mining and steel industries. It has been relied upon for two well-known products: "Armored" Gears and Crane Track Wheels.
- The Pittsburgh Armoring Process is a unique development, guaranteed to give gears and wheels five times the life of untreated, and one-and-one-half times the life of oil-treated gears and wheels.
- As a wholly-owned subsidiary of **BRAD FOOTE GEAR WORKS, INC.**, **PITTSBURGH GEAR** will continue, and expand, its operations as a principal supplier of all types of gears and crane wheels for steel mills, mines, and industry in general. A stock of gears and parts for mine loaders, cutters, and locomotives will be maintained.
- The full research and development facilities of **BRAD FOOTE GEAR WORKS**, and its other subsidiary, **AMERICAN GEAR & MFG. CO.**, will become a part of the over-all service offered by **PITTSBURGH GEAR**. Thus a well-established gear manufacturer is strengthened by its affiliation with one of America's leaders in the gear engineering and manufacturing field.
- Your inquiries are invited.

Lennart L. Gunderson



BRAD FOOTE GEAR WORKS, INC.

Bishop 2-1070 • OLympic 2-7700
1309 South Cicero Avenue • Cicero 50, Illinois

subsidiaries | **AMERICAN GEAR & MFG. CO.** • **PITTSBURGH GEAR COMPANY**
Phone: Lemont 920 — Lemont, Illinois
Phone: ATlantic 1-9950 — Pittsburgh 22, Pennsylvania

ANY tiny production improvement looks big when it can be multiplied by acres of machines. But even without that—in an average size screw machine products shop like Borneman & Peterson's at Flint, Michigan—the improvement effected with Cities Service cutting oil registered impressively.

"We were getting fair results," write Borneman & Peterson, "before ever talking it over with a Cities Service Lubrication Engineer."

But they did talk it over, and then tried out his recommendation on a regular job of cutting ½" x 1" slots in tough tool steel. At once, the use of Cities Service Chillo cutting oil notably improved product quality.

So..."We then tried using Chillo 10 on our threading machines, and found that not only do we get a better thread, but we have increased chaser life approximately 25%."

From there on, still more uses have kept turning up in this shop for Cities Service cutting oil, simply because it distinctly pays off...as it always does when a Cities Service Lubrication Engineer offers pinpointed lubricating recommendations. He draws on the c-o-m-p-l-e-t-e Cities Service industrial line, and on deep, wide experience. You can draw on *him* by writing CITIES SERVICE OIL COMPANY, Dept. D-29, Sixty Wall Tower, New York City 5.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

Note:

To Safety Directors in all Industry.

When selecting a hoist, find out where the weakest point is — and then ask yourself this question: "Will failure of this part allow load to injure the operator?"

for safety's sake

PUT YOUR LOAD ON

the Hook that has never failed

Since its development over 25 years ago, *no one* has *ever* reported the failure of a Coffing Hoist Hook under any load or overload.

. . . And you'll find the same careful engineering for greater safety . . . the same close attention to detail in every part of a Coffing Hoist, for example:

CHALLENGER SPUR GEAR HOISTS have these safety features:

- ★ All steel — even the housing.
- ★ Has five-to-one safety factor.
- ★ Factory-tested at 100 percent overload.
- ★ One man cannot pull a big enough overload to break any part of a Coffing Challenger.

½- and 1-ton capacities

SAFETY-PULL RATCHET LEVER HOISTS have these safety features:

- ★ Ratchet and pawl cannot slip or drop load.
- ★ Handle bends at point of maximum safe overload.
- ★ Handle will not spin or fly up.
- ★ Factory-tested at 100 percent overload.

10 sizes, 1500 lb. to 15 tons

Find out more about the line of hoists that are built stronger for safety's sake. Write Dept. M4.

COFFING HOIST COMPANY

DANVILLE, ILLINOIS

SOLD BY DISTRIBUTORS EVERYWHERE.

Quik-Lift Electric Hoists • Hoist-Alls • Mighty-Midget Pullers • Differential Chain Hoists • Load Binders • I-Beam Trolleys

No "Waste-Time" Weighing...

WITH

FAIRBANKS-MORSE

You speed your weighing operations with Fairbanks-Morse Bench Dial Scales. And that means there are no "bottlenecks" to hold up production all through your plant. Here's why:

With Fairbanks-Morse Bench Dial Scales, weights are read right at the point of the indicator. No time-wasting mental calculations are needed. You can weigh as fast as material can be moved on and off the scale platform. And, easy-to-read charts plus elimination of mental calculations reduce the possibility of human error . . . stop profit-eating weighing losses.

To eliminate "waste time" weighing in your operations, consult your Fairbanks-Morse weighing expert. Or, if you prefer, write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

FAIRBANKS-MORSE,

a name worth remembering

SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • PUMPS
HOME WATER SERVICE EQUIPMENT • RAIL CARS • FARM MACHINERY • MAGNETOS

SIGNIFICANT DEVELOPMENTS IN PRACTICAL LABOR RELATIONS

TOLD IN BRIEF FOR BUSY FACTORY EXECUTIVES

By **PAUL A. KING**, *Bigelow-Sanford Carpet Company, Inc*
Member, New York Bar.

PRODUCTIVITY-BONUS PLAN FOR WAGE EARNERS. *Interested in a ready-made bonus plan approved by the Wage-Hour Division? Here's one a company just worked up.* . . . . . **Page 182**

COST-OF-LIVING BONUS NOT IN OVERTIME COMPUTATION. *Wage-Hour Division's view is vetoed by a court.* . . . . **Page 184**

WAGE-HOUR LAW COVERS PLANT CAFETERIA WORKERS. *Seems the court considers providing food for production workers as vital as any other production process.* . . . . . **Page 184**

ARBITRATORS' VIEWS ON WHITE COLLAR LAYOFFS IN STRUCK PLANTS. *Can this be done? Most arbitrators say yes.* . . . **Page 186**

NON-CONTRIBUTORY PENSION PLAN CAN BE STOPPED *if the pension plan contains certain clauses.* . . . . . **Page 188**

SECRETARY OF LABOR REFUSES BLACKLIST PENALTY. *Shows there's still hope even after Public Contracts hearing examiner and Wage-Hour administrator recommend the penalty.* **Page 188**

NEW FOREMAN FIRING OLD WORKER. *It's not easy unless worker has a factual record indicating poor production.* **Page 190**

BRIEF BUT IMPORTANT. *It's still the law: You must permit employees to hand out union literature in your parking lot . . . When you review a union-shop contract . . . If you are about to file a petition on an interplant inequity . . . A "big" pay controls problem . . . 5% medical expense limitation doesn't apply after 65.* **Page 192**

Productivity-Bonus Plan for Wage Earners

If you've been toying with the idea of increasing worker productivity through a bonus plan, here's one you may wish to look over. It got approval from the Wage-Hour Division.

In going over past records, a company discovered that a ratio of 33.4% in straight-time payroll costs to adjusted net sales was average for the company. (Adjusted net sales was the value of net sales shipped, plus or minus the cost value of inventory changes in finished goods and goods in process.)

If in a particular month the ratio was less than 33.4%, the company considers that a saving was effected as the result of increased productivity. This saving amounts to the difference between the actual straight-time payroll for the month and the standard (33.4% of adjusted net sales).

Savings are distributed three ways: 25% is set aside as a reserve to offset deficits when the ratio is greater than 33.4%; of the balance, the company keeps 30%, 70% is distributed among the employees, percentagewise.

A percentage figure is arrived at by dividing the "70%" by the total straight-time earnings of the participating employees for the month. For this purpose the straight-time payroll includes straight-time pay plus overtime as if at straight-time rates. The worker's share is then determined by multiplying his straight-time earnings for the month by the bonus percentage.

The company also recomputes overtime for the month, basing it on the straight-time earnings plus the bonus. *Turn the page*

MECHANIZE 4 Scrubbing Operations into 1

with a COMBINATION SCRUBBER-VAC!

Applies cleanser, scrubs, rinses, and picks up in ONE operation!

Here's a timely answer to the need for conserving manpower and reducing labor costs—*a single cleaning unit that completely mechanizes scrubbing.* A *Combination Scrubber-Vac* applies the cleanser, scrubs, rinses if required, and picks up (damp-dries the floor)—*all in one operation!* Maintenance men like the convenience of working with this single unit... the thoroughness with which it cleans... and the features that make the machine simple to operate. It's *self-propelled,* and has a *positive* clutch. There are no switches to set for *fast* or *slow*—slight pressure of the hand on clutch lever adjusts speed to desired rate. The powerful vac performs efficiently and quietly.

Model 213P Scrubber-Vac at left, for heavy duty scrubbing of large-area floors, has a 26-inch brush spread, and cleans up to 8,750 sq. ft. per hour! (Powder dispenser is optional.) *Finnell* makes *Scrubber-Vac Machines* in a full range of sizes—for small, vast, and intermediate operations—and in *self-powered* as well as *electric* models. From this complete line, you can choose the size and model that's exactly right for *your* job (no need to *over-buy* or *under-buy*). It's also good to know that you can lease or purchase a *Scrubber-Vac,* and that *there's a Finnell man nearby* to help train your maintenance operators in the proper use of the machine and to make periodic check-ups. For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2504 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

Conserve Manpower with Completely Mechanized Scrubbing

FINNELL SYSTEM, INC.

Originators of Power Scrubbing and Polishing Machines

Everything FINNELL for Floor Care

BRANCHES IN ALL PRINCIPAL CITIES

FOR SKILLED PERFORMANCE BY UNSKILLED OPERATORS

INDOORS and OUTDOORS YOUR *BEST* PROTECTION FOR FLAMMABLE LIQUID, GAS AND ELECTRICAL FIRES

ANSUL DRY CHEMICAL FIRE EXTINGUISHING EQUIPMENT

Textile Lint Fires

Flammable Liquid Fires

Gas Fires

Electrical Fires

HAND PORTABLES
•
WHEELED PORTABLES
•
STATIONARY EXTINGUISHERS AND PIPED SYSTEMS
•
TRUCK MOUNTS, TRAILERS AND SELF-PROPELLED UNITS
•

Ansul Dry Chemical Fire Extinguishing Equipment has world-wide recognition as preferred protection for flammable liquid, gas and electrical hazards. Yet a surprising number of Ansul Extinguishers are used to protect textile mills and paper mills against serious loss from surface fires such as occur in textile lint and combustible paper dust.

The textile and paper making industries rely on Ansul Extinguishers for quick control of dangerous flash fires in class "A" (ordinary combustible) materials. Any remaining embers are quenched with small quantities of water, thereby keeping water damage at a minimum.

Surface fires in textile lint and combustible dusts spread rapidly. They need quick control. If you have serious lint or dust hazards, talk with your Ansul representative. He may have suggestions to reduce fire damage and lost production time.

ANSUL MODEL 20-B

Send for File No. 902. You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped systems and Ansul 2000 lb. Stationary Units.

ANSUL CHEMICAL COMPANY
Fire Extinguisher Division
MARINETTE • WISCONSIN

OFFICES AND DISTRIBUTORS IN PRINCIPAL CITIES IN THE U. S. A., CANADA AND OTHER COUNTRIES
ALSO MANUFACTURERS OF INDUSTRIAL CHEMICALS, REFRIGERANTS AND REFRIGERATION PRODUCTS

PRACTICAL LABOR RELATIONS

Begins on page 182

Cost-of-Living Bonus Not in Overtime Computation

In 1949 when there was hope that the rapid increase in living costs would be halted, a company voluntarily paid its employees a cost-of-living bonus on a monthly basis. Back of the company's mind was the thought that the bonus would be discontinued when the cost-of-living slid back to a more normal basis. When it didn't happen the bonus was discontinued and a permanent wage increase was granted.

Despite this generous attitude on the part of the employer, the Wage-Hour Division came along and asked him to include the bonus in the regular hourly rate when figuring overtime.

A federal circuit court now comes to the rescue and vetoes the Division. The court felt that the payments were temporary, voluntary, and should not be included as requested by the Wage-Hour Division. However, an important fact in this case was: the bonus was based on straight-time *and* overtime pay. If based on straight-time pay alone, the answer would be otherwise. (*Stauss, USDC*).

Wage-Hour Law Covers Plant Cafeteria Workers

Plant cafeteria workers are covered by the Wage-Hour law, says a United States Court of Appeals, if the cafeteria is about the only available eating spot.

The Court said that providing food for production workers is as vital as any other production process. Thus, the activities of the cafeteria workers were closely related to and directly essential to producing goods for commerce. (*E. I. duPont de Nemours*)

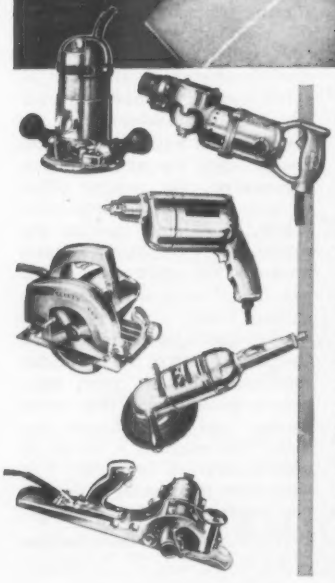
Turn the page

Unretouched photo (section of machine guard) illustrates finished cut made by Stanley Unishear. Portable Unishears can be moved to your work . . . save you valuable set-up time.

U216 Unishear. Capacity: 16 gauge hot rolled steel or galvanized iron. Trims 14 ga. hot rolled steel. Speed: as fast as you can feed it, up to 20 feet per minute. Weight: only 9½ lbs.

Send for Stanley folder — E30. Get the details on the complete line of Stanley Electric Tools. Write to Stanley Electric Tools, 407 Myrtle St., New Britain, Conn.

"Handiest tool in the shop ... and the busiest" STANLEY UNISHEAR



reports

AETNA SHEET METAL WORKS, EAST HARTFORD, CONN.

designers-builders of safety guards for machinery

"Making machine guards — our specialty—calls for cutting tricky curves, angles and notches with speed and accuracy. Stanley Unishears help us to 'make time', save money on every job."

Powerful Unishears save two ways. They save time. Safe and easy to use, Unishears cut five times faster than ordinary hand snips. Unishears save metal — make no waste in cutting — leave a smooth, undistorted edge all along the cut—no time wasted filing, de-burring or trimming.

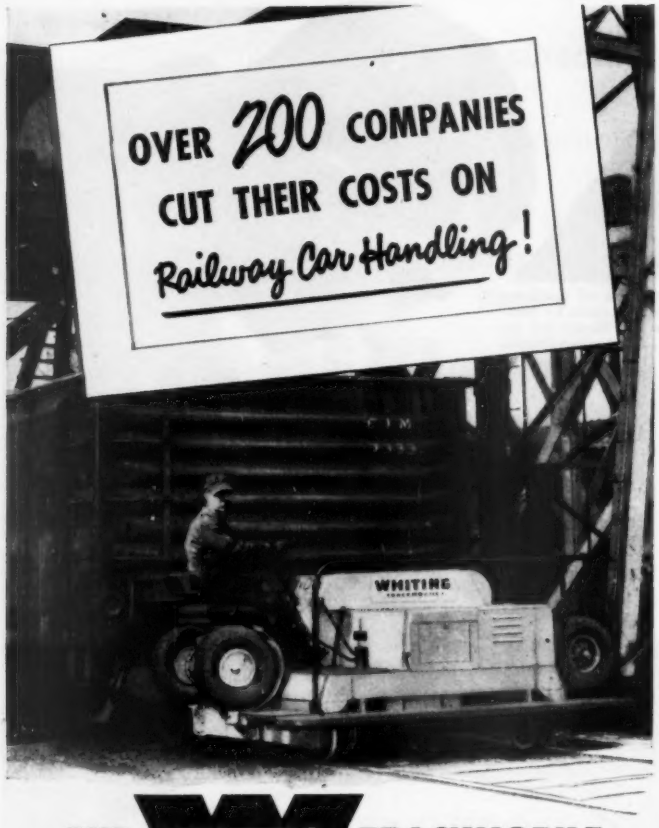
Aetna Sheet Metal Works sums up their preference for Unishears by stating, "Every cut made with a Unishear is a short-cut to savings for us."

Ask your distributor for a demonstration of cost-cutting Stanley Unishears or write to: Stanley Electric Tools, New Britain, Connecticut.

STANLEY

Reg. U.S. Pat. Off.

HARDWARE • TOOLS • ELECTRIC TOOLS • STEEL STRAPPING • STEEL



THE WHITING TRACKMOBILE

PROVED AT THE REFINERY

Standard Oil Company (Ind.) saves time on car moving and spotting at its Whiting refinery!

PROVED AT THE GRAIN ELEVATOR

Anderson Elevator Co., Maumee, O., speeds grain car loading and unloading!

PROVED AT THE COAL MINE

Coal by the carload . . . moved by the minute! Peabody Coal Company uses Whiting Trackmobiles to speed coal loading and car handling during construction of its new mine at Pawnee, Ill. . . gains important savings in time and manpower. Other leading firms from coast to coast are achieving new efficiencies in car moving, spotting and switching . . . using Trackmobile *flexibility* to speed production, reduce demurrage and make manpower more productive. Whether you're handling cars of coal or candy, steel or sand, the Trackmobile can help you!

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See the complete story on the Trackmobile at Peabody . . . facts of value to any industry seeking new economy in car handling. Ask for your copy today!

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Other Whiting Handling Equipment: Overhead Cranes • Economy Cranes • Electric Chain Hoists • Trambeam Overhead Handling Systems

PRACTICAL LABOR RELATIONS

Begins on page 182

Arbitrators' Views on White Collar Layoffs in Struck Plants

In some plants, white collar workers are unionized, as well as production workers. If the production workers go out on strike, this raises two interesting questions as to what to do about white collar workers (who probably have little work to do because of the strike):

—Under the contract, can the white collar workers be laid off without pay?

—If the answer is yes, is it desirable to lay them off, as a practical matter?

The answer to the latter question depends on such factors as the probable duration of the strike, whether any profitable make-work can be assigned, and how tight the labor market is.

But as far as arbitrators go, the answer to the first question is a different matter. Almost to a man, arbitrators have upheld the right of employers to lay white collar employees off under such circumstances. However, in a few cases they have directed that call-in pay be paid.

Arbitrators have even upheld layoffs when the striking union represented the white collar workers as well as the production people. The latest case on the subject involved the United States Steel Co. The arbitrator's award was in line with what has been outlined here.

Of course, a lot depends on the specific wording of the particular contract clause. If yours happens to forbid layoffs, that settles matters, and no arbitrator can help. This suggests a review of your contract is in order. Just what *does* it provide? How can you improve it, if it is too restrictive?

Turn the page

- "Key instrument in inspection"
- "Protects quality prestige"
- "Customers' rejections less than 1/50 of one per cent"
- "Saves from $3 to $5 per hour"

Photo Courtesy of Modern Corp., Detroit, Mich.

Modern Corporation, Detroit, Mich., manufacturer of fine MODCO cutting tools, says this about their new 30-inch J & L Comparator:

"Modern Corporation's new 30-inch J&L Comparator has become the key instrument in the inspection of fine MODCO tools. Its size enables the inspector to examine the complete contour of most tools, without transfer of reference points, and thus without the chance for human error to creep in.

While the primary reason Modern Corporation bought the Comparator was to promote inspection accuracy, it is showing an important cost saving: Every time the J&L Comparator is used, it saves from three to five dollars per hour, depending on the tool under inspection!"

This instrument is one of 14 J & L Comparators in the Modern Corporation plant, and the largest.

P.S.

Jones & Lamson Comparators guarantee swift, sure QUALITY CONTROL — *throughout your production lines.* Write for Catalog No. 402. One of our eleven models will fit your needs.

Jones & Lamson Machine Company
Springfield, Vermont, U. S. A.
Please send Comparator Catalog No. 402.

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COMPANY_____

STREET_____

CITY_____ STATE_____

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

J&L

Machine Tool Craftsmen Since 1835

COMPARATOR DIV.
Dept. 710

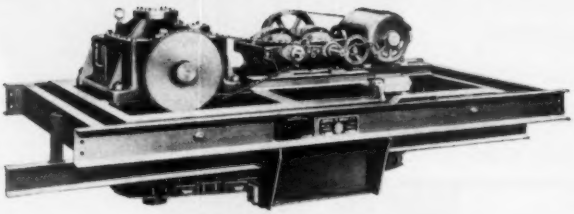
The FIRST Flying Carpet

was "FLOATED" by an Old Caliph in Bagdad

He mentioned it frequently in his famous Tales of the "Thousand and One Nights." Since then "air space" has been put into use for many mechanical devices . . .

Not a floating carpet — but a powerful pulling "work-horse" for conveyor systems is the

FLOATING DRIVE with AUTOMATIC CUT-OFF and LOAD INDICATOR



another FIRST by JERVIS B. WEBB COMPANY

For years a standard on Webb Conveyor systems, the patented Floating Caterpillar Drive enables automatic limit switch cut-off in case of jam, cushions starting load, and has an easily seen calibrated load indicator.

The motivating power unit on both the Caterpillar and Sprocket type Webb drives floats on wheels against heavy springs. When a conveyor starts, the initial shock is taken by these springs.

If external forces jam the conveyor, the springs are compressed to a point where the moving frame actuates a limit switch on the fixed frame, stopping the drive instantaneously. As soon as the jam is eliminated, the conveyor may be started immediately by push button. There are no shear pin headaches. If a conveyor becomes overloaded, this fact is indicated at once as the compressor springs move an arrow indicator to a red danger area.

CONVEYOR ENGINEERS AND MANUFACTURERS

JERVIS B. WEBB COMPANY

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FACTORIES IN DETROIT . . . LOS ANGELES . . . HAMILTON, ONT.

PRACTICAL LABOR RELATIONS

Begins on page 182

Non-Contributory Pension Plan Can Be Stopped

If you are voluntarily setting up a non-contributory pension plan, be sure you put in a clause giving you the right to "change, amend, or discontinue the plan." Better put in a clause, too, to the effect that "the adoption of the plan is entirely voluntary on the part of the company and it shall not be construed as creating a contractual relationship between the company and an eligible employee, nor shall it be construed as a term of any employment contract, or be interpreted to give the right to any employee to be retained in the company's service."

These clauses in the pension plan of the Encyclopedia Britannica came in handy; the company was sued by a group of employees when it had discontinued full contributions to the plan. The employees claimed that the company was compelled under the law to continue them. There was a binding contract, they said. However, the U. S. District Court, which decided the case, said that because of these clauses—and the nature of the plan—the plan was nothing more than an unenforceable gratuity and the company could stop making contributions.

Secretary of Labor Refuses Blacklist Penalty

No employer who ever has been placed on the government's "no defense contracts" blacklist will accuse the Secretary of Labor of being an old softy. But here is one case where the Secretary relented—despite the recommendations of the Public Con-

Turn the page

A Profitable Partner For You

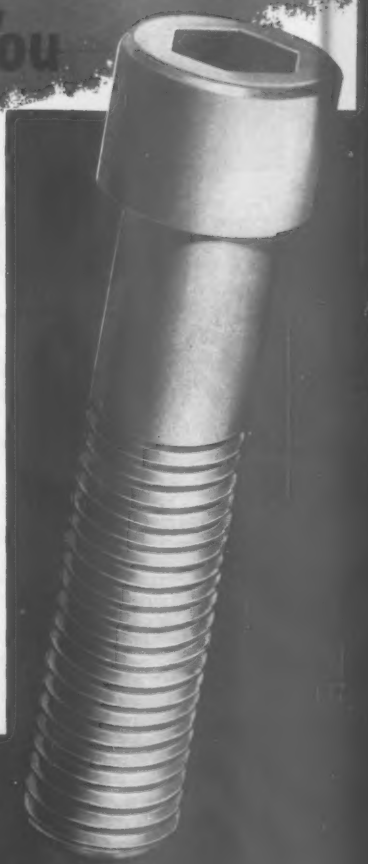
YOUR B-RIGHT-ON SOCKET SCREW DEALER

IF you're a user of socket screw products, there's a man in your community you should know . . . your Brighton dealer. He holds his Brighton franchise because he's wise to the ways of socket screws . . . understands their uses and applications and can be really helpful to users of Brighton products.

He's well able to give prompt service to you because he maintains adequate local stocks of Brighton screws. And besides, he has the centrally located Brighton factory stock to back him up. His line of Brighton screws is a true quality line . . . up to your standards of accuracy, uniformity and every other requirement.

You'll find your Brighton dealer will make a profitable member of your production team . . . call on him whenever there's a question on socket screws. Write for the name of your nearest Brighton dealer.

Socket Screw Products of All Kinds



THE BRIGHTON SCREW & MANUFACTURING CO.

HOW WOULD YOU MOVE THIS
Pile of Parts?
LIKE THIS?... OR THIS?...

Generalift
★ ★ ★ ★ ★
PALLET BOXES
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Write for your FREE copy of "The General Box." It shows how to Cut Packing and Shipping Costs.

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Generalift Pallet and Pallet Box
General Watkins-Type Box

PRACTICAL LABOR RELATIONS

Begins on page 182

tracts Hearing examiner and the Wage-Hour administrator.

In refusing to blacklist this company, the Secretary said:

—the company paid about $17,500 in damages;

—a recent investigation showed that the company was currently living up to the law;

—the blacklist penalty would shut down the company's plants, throwing about 500 workers out of important defense work.

His decision here shows there is still hope — even after you have been ruled against. (*Benj. Kahn*)

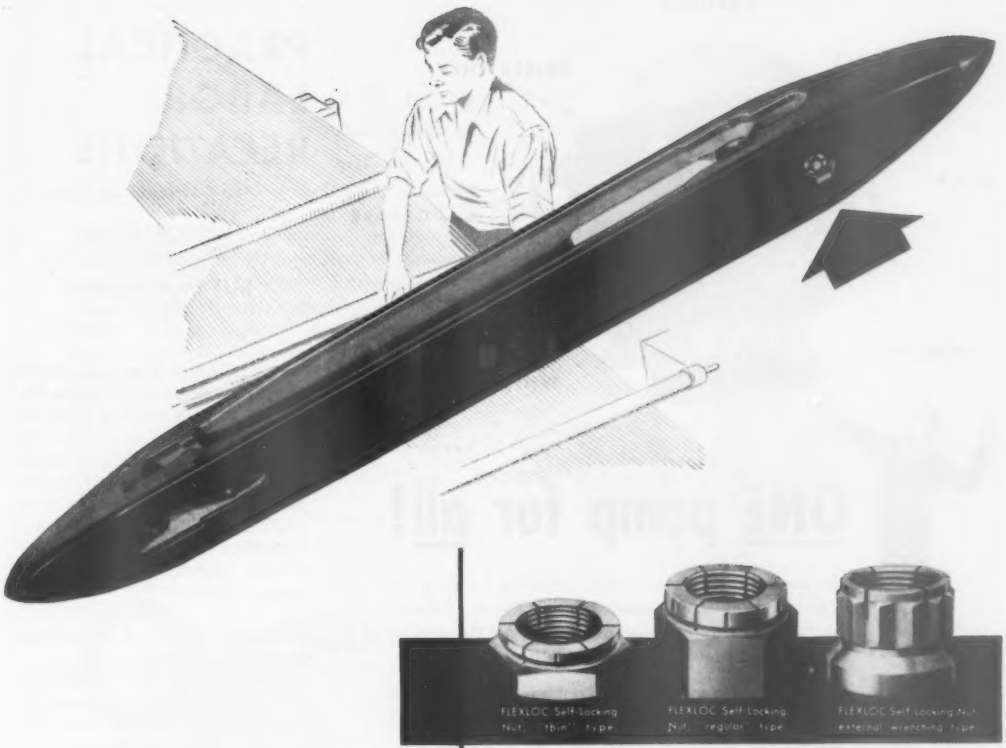
New Foreman Firing Old Worker

Very often a new foreman would like to fire a worker hired by his predecessor. He finds him inefficient. Perhaps his standards are higher. If there is a union in the plant, such a foreman may have a tough time.

In a case heard by Arbitrator Michael I. Komaroff, a new assistant foreman demoted a worker from the classification "electrician A" to "electrician B." Said he couldn't do layout work required of an "electrician A." But the electrician had been on the job for several years without having been warned about poor work. The union kicked.

The arbitrator said that this electrician could not be downgraded. To demote an employee after many years of apparently satisfactory service, the company is expected to prove its case beyond any reasonable doubt.

If this assistant foreman had issued reprimands, or had some factual record indicating poor production, he might have succeeded. (*North American Aviation Award*) *Turn the page*


FLEXLOC Self-Locking Nut, "thin" type
FLEXLOC Self-Locking Nut, "regular" type
FLEXLOC Self-Locking Nut, external wrenching type

IMPACT WON'T WORK THEM LOOSE

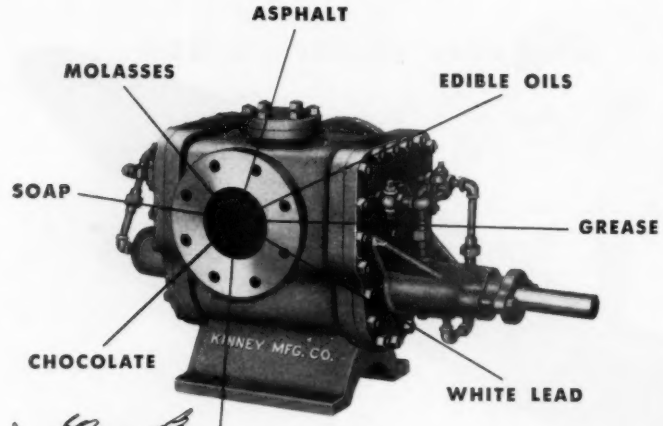
FLEXLOC Self-Locking Nuts are widely used on shuttles and other high speed, vibrating equipment where positive locking fasteners—the kind that stay tight even under severe service—are essential to operation of the equipment and safety of the personnel.

FLEXLOC Locknuts also offer one-piece, all-metal construction—nothing to work loose or drop off; no serious temperature problems—up to 550°F. does not affect them; resilient, automatic locking sections—processed to assure unusually uniform torques.

FLEXLOC Locknuts will solve many fastener-loosening problems. We'll be glad to supply FLEXLOC samples for tests on your equipment. Let us know the sizes needed. STANDARD PRESSED STEEL Co., Jenkintown 11, Pennsylvania.

FLEXLOC® LOCKNUT DIVISION

SPS
JENKINTOWN PENNSYLVANIA



ONE pump for all!

This positive displacement pump is *right* for handling the widest range of viscous materials! It's the Kinney SD Rotating Plunger Pump — the one pump that's got the stamina to take heavy punishment . . . and *like* it.

VERSATILITY — Kinney SD Pump handles a wide variety of materials without adjustment. Steam-jacketed models are available in many sizes.

RUGGED CONSTRUCTION — Kinney SD Pump is built for heavy service. Rotating parts, bearings, and castings are all conservatively rated . . . designed for years of faultless performance.

COMPLETE SIMPLICITY — Kinney SD Pump has only seven moving parts . . . no valves to stick or gum up . . . no obstructions to impede the flow of viscous materials.

HIGH EFFICIENCY — Kinney SD Pump pulls to a 29" vacuum . . . delivers liquids with meter-like volumetric efficiency. Its rotating plungers are set 180° apart, giving perfect balance and smooth, steady output.

Kinney SD Pumps are available in 38 standard sizes with displacements from 2 GPM to 3360 GPM . . . for pressures to 250 psi, depending on size of pump, and viscosity of liquid. Send coupon for complete details. Kinney Manufacturing Company, Boston 30, Mass. Representatives in New York, Philadelphia, Chicago, Cleveland, Houston, New Orleans, Los Angeles, San Francisco, Seattle, and foreign countries.

Kinney LIQUID PUMPS

KINNEY MANUFACTURING COMPANY
3624 Washington St., Boston 30, Mass.

Please send me Bulletin L51 describing Kinney Liquid Pumps.
My liquid pumping problem involves:

☐ Acid Sludge ☐ Asphalt ☐ Chocolate ☐ Crude Oil
☐ Lube Oils ☐ Edible Oils ☐ Fuel Oils, Diesel Oil ☐ Grease
☐ Molasses ☐ Paint, Enamel ☐ Road Oil ☐ Soap, Glycerine
☐ Tar ☐ White Lead ☐ Others (see letter attached)

Name ..... Company .....

Address .....

PRACTICAL LABOR RELATIONS

Begins on page 182

BRIEF BUT IMPORTANT

It's still the law: You must permit employees to hand out union literature in your parking lot or on other company property — if that's the only way employees can be approached effectively by the union. This plant was far from town and the NLRB considered it hazardous to make the union distribute leaflets on the public roads. (*Caldwell Furniture*)

When you review a union-shop contract, you need not offer to employees who are already members the 30-day non-membership grace period—only to new employees. (*Josten Engraving*)

If you are about to file a petition on an interplant inequity or "fringe" wage practices, with the Wage Stabilization Board, you can speed things up by making sure you furnish the board with adequate dope on comparative industry or area rates and practices.

A "big" pay controls problem: A looseleaf reporting service reports that the Ninth Regional Wage Stabilization Board is faced with its "biggest" problem under the pay controls program. Seems that the General Waste Trading Co. of St. Louis filed a pay increase petition measuring 2½ x 4¾ feet. But the board's files measure only 15 x 22 inches.

The 5% medical expense limitation under the tax law does not apply to cases where either a husband or wife has reached age 65. It was eliminated by the 1951 Revenue Act.

Meet Everett H. Clark
General Manager
International Packings Corporation
Affiliated with Graton & Knight Company

Educated at Worcester Polytechnic Institute, Mr. Clark met his first packings problems as a designer and manufacturer of precision instruments. With Graton & Knight Company since 1935, he has been factory worker, foreman, sales correspondent, sales engineer, sales manager and finally General Manager of the Packings Division. He wrote the 320-page Graton & Knight Packings Manual, which has been adopted as a text book in many of the technical schools and colleges. A member of the Standards Committee of the American Leather Belting Association, he is now at work on the standardization and simplification of packings through the Joint Industry Conference.

In this current series of advertisements we want you to meet these men. Their experience is yours to command.

There's a personal side to every packings problem

It lies beyond the Dash number, with its dimensions. It involves questions relating to fluid: its pressure and temperature range; to apparatus: its function, metals and finishes . . .

At G&K-INTERNATIONAL your answers to these questions receive the personal attention of men who have lived and worked with packings applications for many years. Their experience in leather and impregnants, in basic rubbers and compounds, in design and manufacture . . . all are summed up for you in packings that meet *your* needs exactly.

second century G and K — INTERNATIONAL
GRATON AND KNIGHT ESTAB. 1851

Leather and synthetic packings

GRATON & KNIGHT COMPANY
Worcester 4, Mass.

INTERNATIONAL PACKINGS CORPORATION
Bristol, New Hampshire

"Tycol Acylkup boosts bearing life... smooths the way for heavier loads"

Of course! Tycol Acylkup Bearing Grease "stays put" . . . keeps anti-friction bearings running smooth and cool. Finest quality neutral oils give it high load-carrying capacities. Tycol Acylkup is firmly resistant to the washing action of water. Its dependable lubricating abilities lengthen bearing life and reduce maintenance costs. Call your nearest Tide Water Associated office for further information.

TYCOL

INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C. • Pittsburgh
Philadelphia • Chicago • Detroit
Tulsa • Cleveland • San Francisco

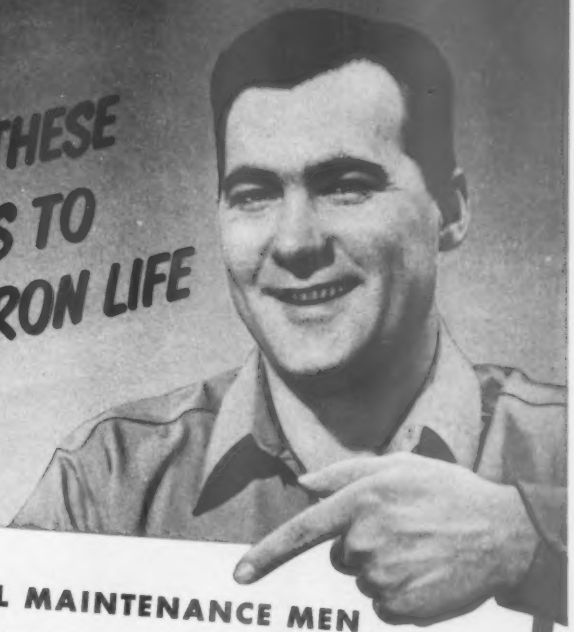
TIDE WATER ASSOCIATED OIL COMPANY

17 BATTERY PLACE - NEW YORK 4, N.Y.

SEND FOR A FREE COPY OF "TIDE WATER ASSOCIATED LUBRICANIA"

WANT TO REDUCE OUTAGES... CUT MAINTENANCE COSTS?

G.E. GIVES YOU THESE 8 EASY WAYS TO PROLONG IGNITRON LIFE



TO ALL MAINTENANCE MEN

1 Check regularly all circuit components such as power circuit-breakers, control relays, ignitor-blocking rectifiers, and water-flow relays.

2 Maintain adequate flow of water at temperature low enough to provide proper cooling effect. Keep ignitron water-jackets clean by using water that is pure and free from sediment.

3 Guard against excessive vibration and shock to ignitrons in use.

4 Don't exceed maximum equipment ratings under load.

5 When a new tube is placed in service, operate it at reduced ratings for the first half hour, to evaporate any mercury off the glass bushings and anode.

6 When storing or handling ignitrons, make sure the tubes stay right-side-up so that mercury will remain properly distributed.

7 Keep stored tubes away from chemicals, strong fumes, moisture, and extreme heat and cold.

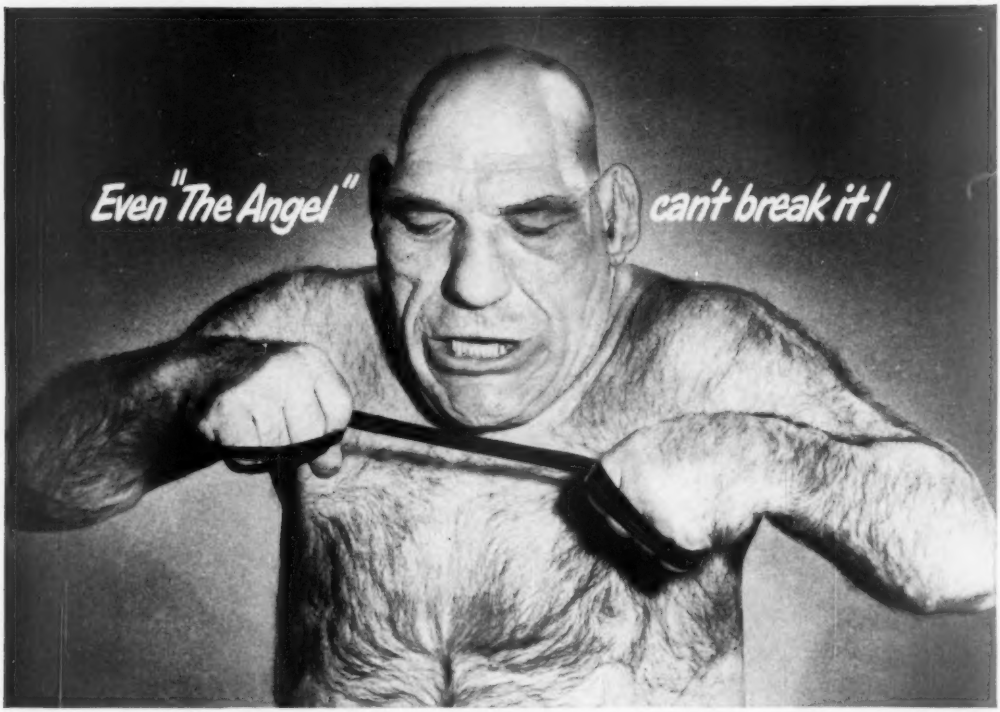
8 Store new ignitrons in their original G-E cartons, built to protect them.

● **FOLLOW THESE RULES** to get more service, greater dependability from the ignitrons that control your welders and large d-c motors! Thus far, G-E expanding production has been able to supply industry's need for ignitrons. But certain component materials are critical. So conserve life, protect performance, of the tubes you have!

YOUR G-E TUBE DISTRIBUTOR will gladly cooperate in every way. When ignitron replacements become a "must", he will leave no stone unturned to keep your equipment operating. Jot down his telephone number *now* for quick, convenient use! *Tube Department, General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

161-182



World's strongest tape?

You can tow a truck with it, lift huge weights with it! "Scotch" Brand Filament Tape is so strong even "The Angel," famous French wrestler Maurice Tillet, can't break it. And it's *resilient*, too—absorbs jolts and jars again and again.

That's why companies like IBM, Gulf Oil Corp., American Cyanamid Co. and others find this new kind of packaging tape does the job on their heavy-duty strapping, banding, palletizing.

It gives up to 10 times the tensile strength of most other pressure-sensitive tapes because it's made with thousands of continuous rayon or glass filaments. And it withstands repeated impact shock because these filaments are embedded in a tough, pressure-sensitive adhesive.

Try it today! If you'd like more facts or a free sample roll for testing purposes, write Minnesota Mining & Manufacturing Co., Dept. FM-42, St. Paul 6, Minnesota.

NO SLIPPING of unit or palletized loads when "Scotch" Brand Filament Tape bands top layer of cartons together at Gulf Oil Corporation! Tape takes hold, holds tight, has no sharp edges.

Quick facts about
"Scotch" Brand Filament Tape

- **SHOCK-RESISTANT**—absorbs jolts and jars again and again.
- **SAFE**—no sharp edges to injure workmen.
- **ECONOMICAL**—short strips handle big jobs.

3M

The term "Scotch" and the plaid design are registered trade marks for the more than 200 pressure-sensitive adhesive tapes made in U.S.A. by Minnesota Mining & Mfg. Co., St. Paul 6, Minn. —also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 270 Park Avenue, New York 17, N. Y. In Canada: London, Ont., Can.

Drilling Problem?

Black & Decker's Drill Line is a good bet to solve it!

Completeness of Line, Quality Construction Pay Off for Users!

FOR drills to fit your needs—for top performance on any portable drilling job—it pays to check Black & Decker *first!* That's because Black & Decker gives you an unmatched choice of Drill models. Capacities from ¼" to 1¼"—choice of handle arrangement for easiest operation—choice of speed, power and price in most capacities. And it's also because Black & Decker Drills give you powerful B&D-built motors—full ball-bearing construction—extra-tough gears, shafts and chuck spindles—husky housings, streamlined design, perfect balance.

Whether your problem is in production, maintenance or construction—whether it requires large or small drills—see your nearby B&D Distributor *first* for expert help. And write today for free, detailed catalog to: THE BLACK & DECKER MFG. CO., 623 Pennsylvania Ave., Towson 4, Maryland.

B&D

WORLD'S LARGEST, MOST COMPLETE LINE

YOU MUSTN'T MISS—

INDUSTRIAL NEWS, BEGINNING ON THIS PAGE

TIMELY HINTS TO BETTER MANAGEMENT ON PAGE 206

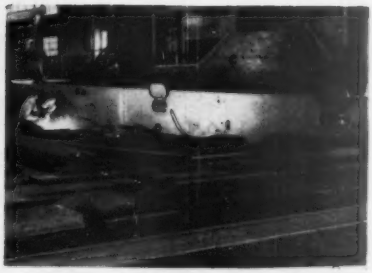
QUOTES FROM INDUSTRY'S LEADERS ON PAGE 224

IDEAS TO STIMULATE YOUR THINKING, ON EVERY PAGE

How Four Plants Get Better Results...

...EYE SAFETY

Lift goggles off hook or the grinder won't work. Then follow the directions on the sign and "Wear Those Goggles." Simple? Sure. What's more, says Hawaiian Pineapple Co., Honolulu, it helps save employees' eyes.



...SAVING FLOOR SPACE

You can weld on both sides of the battery of eight arc welders that run down the center of the shop, says Chicago Bridge & Iron Co., Chicago. Set-up also cuts cable requirements in half, results in savings of 30%.

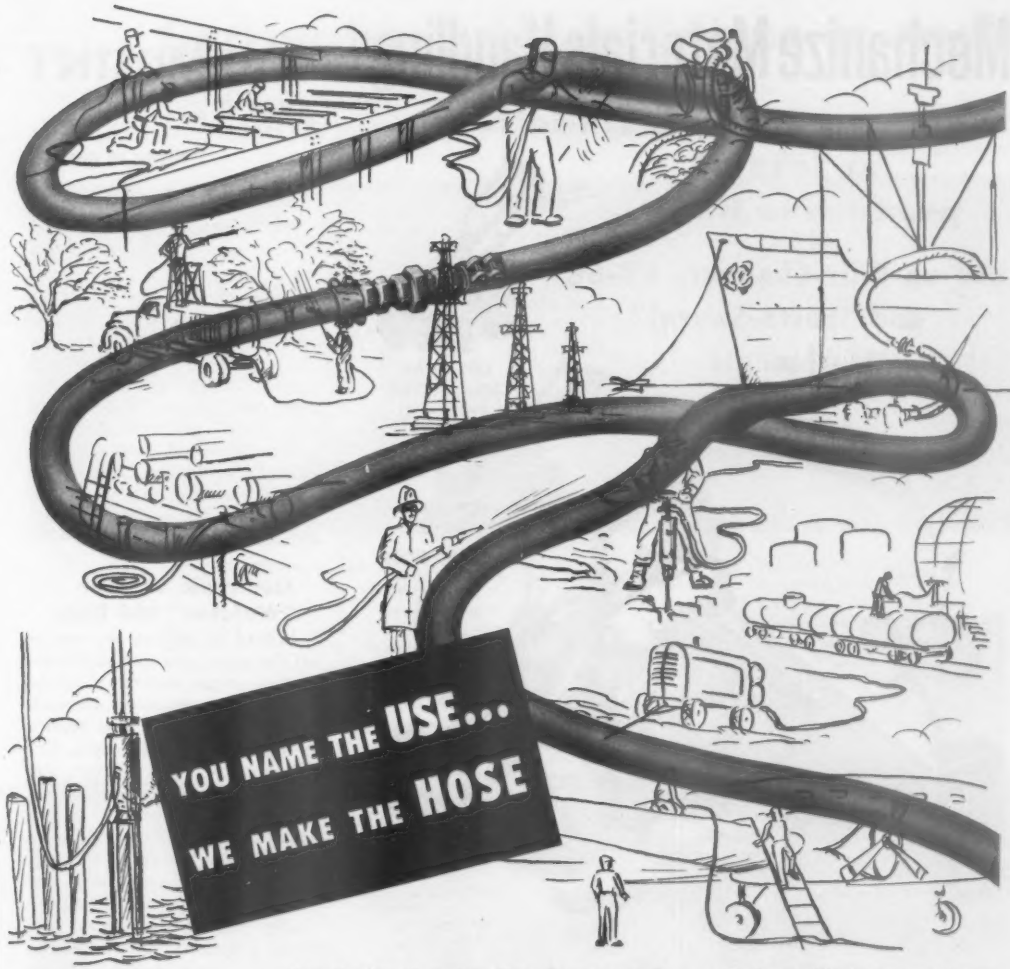
...INSPECTION

An air gage checks the size of five bearings plus alignment at the same time for DeSoto Div., Chrysler Corp., Detroit. DeSoto says they're faster than mechanical gages. And more accurate, since they have no moving parts.

...PRODUCTION WELDING

Welder's' paradise is the hull welding job at Cadillac's Cleveland Tank Plant. Trunnions mounted on merry-go-round track rotate 360 degrees to place every part of tank hull within reach.

INDUSTRIAL NEWS



Our Condor Homoflex Hose is an example . . . Raybestos-Manhattan engineers found a way to build strength into a hose-wall without simply adding weight and thickness in more plies. The result, this Hose is flexible as a rope . . . and a real labor saver wherever men must constantly work with hose. On the other hand, Raybestos-Manhattan makes the world's *largest* and *heaviest* hose for oil drilling and loading, and for suction • Hose may not be your problem today, but whenever you think of industrial rubber products . . . transmission, conveyor, V-belts, or hose . . . remember R/M engineers have developed exclusive features to give you more for your money in every use. Consult your R/M representative.

R/M

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks
Clutch Facings • Asbestos Textiles • Sintered Metal Parts • Bowling Balls

Mechanize Materials Handling

without costly installations or loss of productive time...

use an Allis-Chalmers HD-5G and Tracto-Shovel Attachments—

LIFT FORK ATTACHMENT
Stacking Height (under forks) - - 106 in.
Lifting Capacity 4,000 lb.
CRANE HOOK
Lifting Height (hook to ground) 138 in.
Lifting Capacity 5,000 lb.
40.26 drawbar hp.
1 cu. yd. bucket
Dumping height 9 ft., ¼ in.

You speed materials handling "right now" when you put this fast-working tractor-shovel combination on the job. The HD-5G starts boosting production without waiting for costly installations or changes in plant layout. Digs into the toughest jobs, indoors or out... lifts, loads, excavates, pushes, tows... handles all materials, bulk, solid or packaged.

And it works easily in close quarters — turns in its tracks . . . has no bulky, overhead structure. Outdoors, the track-type tractor is not bothered by weather or ground conditions . . . works the year around, even in unpaved yards.

Choice of thirteen interchangeable Tracto-Shovel attachments makes the HD-5G a one-tractor material handling fleet. Special buckets, lift fork, crane hook, rock fork, 'dozer blades and others may be interchanged in a few minutes with simple tools.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

YOU MUSTN'T MISS—

Begins on page 198

Gold Standard to Gage Smoothness

Now you can gage surface smoothness with the same kind of accuracy that you can get in measuring dimensions. General Motors and Chrysler Corp. engineers have come up with a surface finish standard—using pure gold master blocks—that's accurate to a millionth of an inch.

Establishing the standard was part of a seven-year joint G. M.-Chrysler engineering project for improving the quality of machined parts.

Electronic Scanner "Watches" 400 Dials

Instead of keeping an eye on all the gages and meters in your factory of the future, you'll be able to use a foolproof electronic watchman-reporter. One recently built by Taller & Cooper, Inc., Brooklyn, N. Y., will detect, signal, and record conditions in as many as 400 separate circuits. When trouble comes you'll know exactly when and where it began.

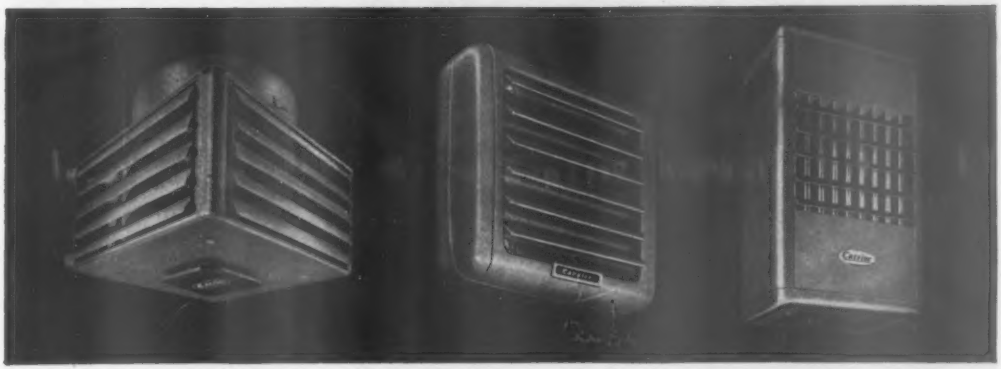
Though the instrument was custom-built for the Tennessee Valley Authority's Johnsonville, Tenn., power installation, similar scanners could record data on flow of materials, temperature and steam pressure, product quality, and continuous sampling. In the metal working plant it could report on the conditions of such things as the various components of automatic transfer machines, automatic gages, and conveyor operation.

Brain of the system is a memory device that stores up to 26 different reports on occurrences that happen as close as 1/1000th of a second apart. It then feeds the information to a recorder and printer that gives you a continuous and complete log of the day's operations.

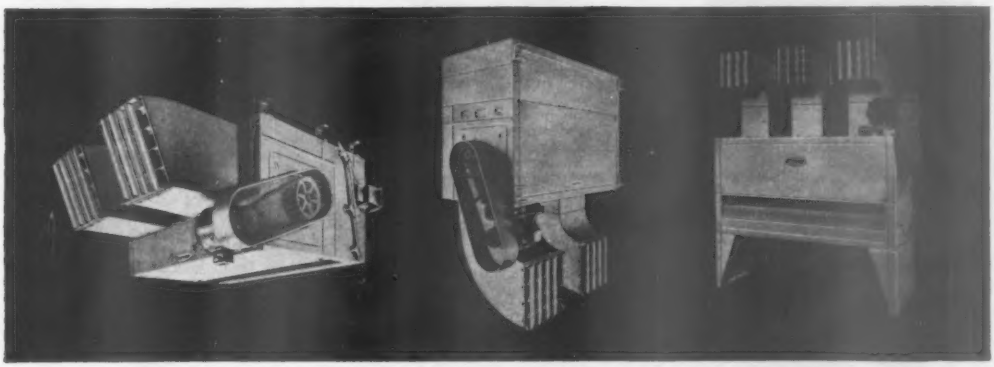
Turn the page

Carrier heats big buildings or small

Any size space can be heated efficiently, economically, with Carrier heating equipment



CARRIER PROPELLER-FAN TYPE UNIT HEATERS. *Four-way, Directed-flo vertical model 46S* discharges warmed air in 1, 2, 3 or 4 directions, at any angle, in any quantity. Gives quick heat from higher ceilings. 7 sizes: 82,000 to 500,000 Btu's. Steam or hot water. *Horizontal model 46U* is attractive, quiet, rugged. Ideal for wall installations. Single-row Aerofin heating coil with widely spaced fins offers less air resistance, makes cleaning easier. 10 sizes: 21,000 to 200,000 Btu's. Steam or hot water. *Gas-fired models 46T, shown, and 46TD (duct type)* supply clean, economical heat wherever gas is available—offices, factories, stores, etc. Both feature one-piece heat exchanger and combustion chamber of Aluminized Steel. 7 sizes: 70,000 to 230,000 Btu's. AGA-approved for all types of gas. *Write Carrier Corporation, Syracuse 1, N. Y., for the folder, "Unit Heaters."*

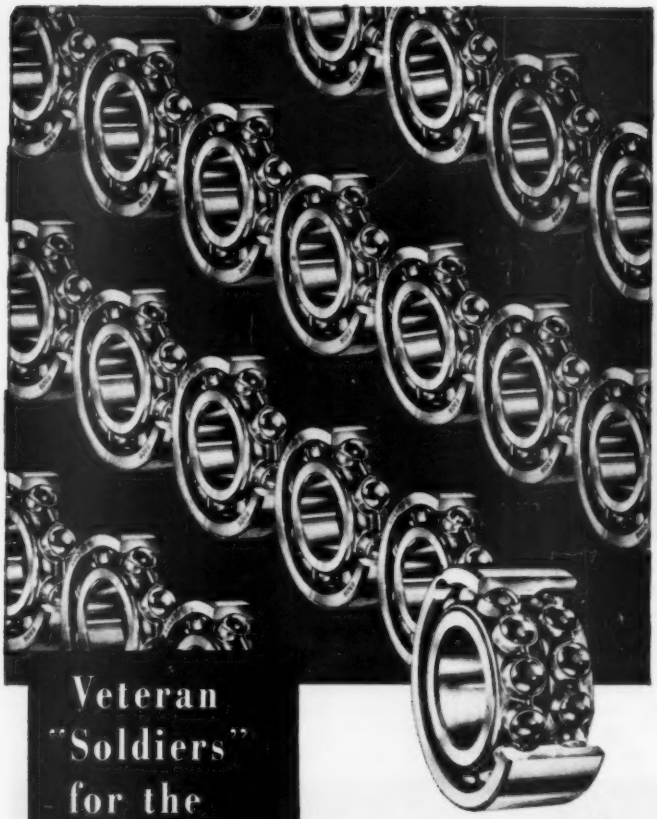


CARRIER BLOWER TYPE HEAT DIFFUSERS 46P,Q,R heat and ventilate larger enclosed areas in garages, hangars, warehouses, factories, etc. Multiple discharge outlets with adjustable louvers deliver air in practically any direction. Floor, wall or ceiling mounted. Sectionalized for easy handling—quickly altered to fit changing requirements. 7 sizes, to 1,720,000 Btu's. Air-handling capacities from 4000 to 25,000 cfm. Steam or hot water.

Carrier

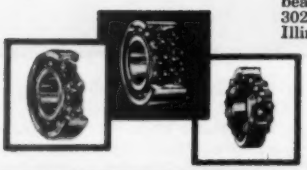
The Unit Heater Industry is proud of the recognition accorded it by the armed services and procurement departments of the United States Government. Proven in grueling use during World War II, unit heaters are now standard equipment in ships, plane hangars, living quarters, garrison buildings—wherever reliable, efficient heat is necessary for the completion of a task or the well-being of our fighting forces. On the home front, unit heaters serve equally important roles in industrial plants producing war material supplying the needs of the allied forces.

AIR CONDITIONING • REFRIGERATION • INDUSTRIAL HEATING



Veteran "Soldiers" for the Production Lines

Today, more than ever, products must be "best ever" in construction and dependability. So must the machines depended on for uninterrupted production schedules. In this preparedness race, veteran soldiers, like Ahlberg precision ball bearings, are being specified for defense products and production machine maintenance as never before. The reason has been simply test and comparison, in search for the best, by manufacturers from coast-to-coast. Better products plus reduced operating and maintenance costs of the machines you use can well be yours by using Ahlberg precision ball bearings. Ahlberg Bearing Company, 3025 West 47th Street, Chicago 32, Illinois.



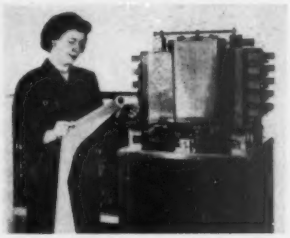
AHLBERG

PRECISIONeered Anti-Friction Products

Since 1908

YOU MUSTN'T MISS—

Begins on page 198



SHE'S JUST UNLOADED A ROLL of information from the machine. Believe it or not, this . . .

Electronic Typewriter Can Keep Your Books

Would you like to cut your paperwork brigade by 90%? Potter Instrument Co., Great Neck, N. Y., has an electronic printer that it says will do just that. Coupled with an electronic computer, this so-called flying typewriter can maintain entire payrolls, keep running inventories, schedule production, and serve as a complete filing system, says Potter. And it can do its work at a speed of 24,000 characters a minute, printing an 80-character line of type almost instantaneously using standard typewriter ribbon, the company claims.

How it works · Major component of the machine is a memory unit. It accepts information in coded form from a computer, magnetic tape, punched cards, or other external source, then translates it into printed form a line at a time.

Big Betatrons See Through Steel

When you inspect a thick steel casting for flaws, a good bet is to use a betatron. Trouble is they run into lots of money. Take the one at Allis-Chalmers Mfg. Co., West Allis, Wis., for instance. The 22-million volt machine can detect flaws in steel structures up to two feet thick, the company

Tape it with Behr-cat*

There's no better test for a masking tape than the one shown above. When you're in a tough spot, you want a tape that helps you do the job fast—and right—the first time. BEHR-CAT masking tape is first choice because it gets through hard jobs in jiffy time. It goes on easily with one pass of the finger and stays put until you're ready to strip it. Morever, when you flex it around curves, you'll find no trouble with torn edges. And because it's thin and strips clean, you'll find it produces a superior color separation job.

YOUR SPECIAL TAPE PROBLEM is welcomed at BEHR-MANNING. Our fully staffed laboratories are at your service. Put us to the test. Write today. Address Dept. FM-4.

*Trade Mark

BEHR-MANNING

division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

Main Office and Plant: Troy, N. Y.
For Export:
Norton Behr-Manning Overseas Inc.

Cushion against Calamity

One burned out motor, one stalled conveyor, can throw schedules out of kilter, waste materials, waste man-hours. That's why so many electric motor users are turning to the modern-day "cushion" against that kind of calamity. Twin Disc's industrial *fluid drive* HYDRO-SHEAVE fits right on over motor shaft, absorbs all shocks, improves the power factor, gives *any* motor more *oomph* by providing s-m-o-o-t-h and rapid acceleration.

Such ways to apply power . . . either friction clutch or fluid drive . . . make Twin Disc important to America's efficient production machine.

Slipped on the electric motor shaft in a few minutes, the Twin Disc HYDRO-SHEAVE helps a little motor do a bigger job; provides a cushion against shock-loading, improves the electric-power factor with smooth acceleration. For all motors and engines developing from ¾ hp to 50 hp.

. . . and
TWIN DISC applies
the production-power!

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

YOU MUSTN'T MISS—

Begins on page 198

says. But a large concrete building had to be built to house it. Total cost of betatron plus shelter: $342,000.

The average cost of a betatron alone is about $225,000, according to the Steel Founders' Society, Cleveland. But that doesn't prevent several eastern and midwestern companies from using them. One of the latest is a 24-million volt betatron that's been installed at General Steel Casting Corp., Granite City, Ill. It's going to X-ray steel for Army tanks, will penetrate a steel casting 7 to 9-in. thick, and produce a clear 14- by 17-in. picture of the metal.

"Floating" Metal Melts Cleaner

When you're melting high temperature metals—like titanium—in crucibles or furnaces, there's always a danger of contaminating the metal with the refractory material. So Westinghouse Electric Corp. did some research, and came up with a process it calls float melting. The metal touches nothing solid, only the air or gas around it. And you can add alloying agents to the molten mass while it's floating between two electrodes.

How it works · You place the metal between two slightly conical horizontal coils of copper spaced a few inches apart and supplied with energy at 10,000 cycles. Apply power and the metal floats up into a space half-way between the coils. It begins to spin, glow, soften, and liquefy. Cut off the power and the molten metal drops into a crucible below, solidifying almost on impact.

The process is still in the developmental stages at Westinghouse. So far it's only been used on small samples and on a limited number of metals. *Turn the page*

STOP RUST! with RUST-OLEUM

Protects Tanks, Pipes, Girders, Metal Sash, Fences, Roofs and Buildings, Rail and Marine Facilities

BEAUTIFY AS YOU PROTECT—ALL COLORS, ALUMINUM AND WHITE!

RUST-OLEUM may be applied directly over *rusted surfaces without removing all the rust!* Just remove rust scale and loose particles with wire brush and sharp scrapers . . . then apply by brush, dip, or spray. Costly sandblasting and chemical pre-cleaning are not usually required. Easy as that to cut your maintenance costs. Specify **RUST-OLEUM** to your painting contractor or architect for *every rustable* metal surface! Prompt delivery from Industrial Distributor stocks in principal cities.

RUST-OLEUM CORPORATION
2452 Oakton Street • Evanston, Illinois

FREE SURVEY: A **RUST-OLEUM** specialist will gladly survey your rust problems. He'll make specific tests and recommendations. No cost or obligation. See Sweets for complete catalog and nearest **RUST-OLEUM** distributor, or write for literature on your company letterhead.

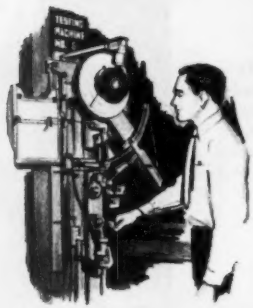
Stopping Rust with **RUST-OLEUM** 769 D. P. Red Primer

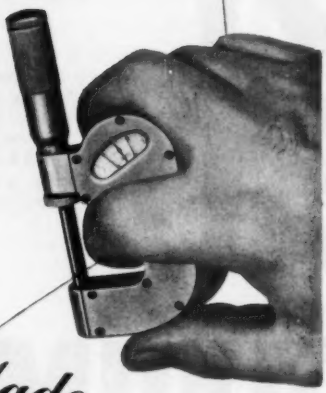
CLIP THIS TO YOUR LETTERHEAD
MAIL TO: RUST-OLEUM CORPORATION
2454 Oakton Street • Evanston, Illinois

- ☐ Have a Qualified Representative Call
- ☐ Full Details on Free Survey
- ☐ Complete Literature
- ☐ Nearest RUST-OLEUM Source

Look for this label — be sure it's genuine RUST-OLEUM

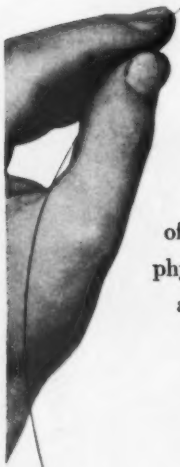
JOHNSON



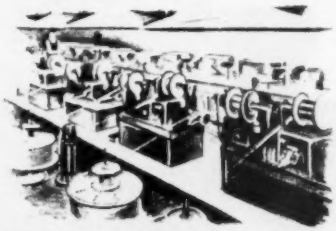


Custom-Made

Specialty Wires



A quarter of century of progress —new and better ways to produce custom-made specialty wires, wires of absolute uniformity of prescribed physical and metallurgical properties and drawn exactly to the size which best meets your requirements.



"Johnson Sets the Standard of the Industry"

JOHNSON

JOHNSON STEEL and WIRE CO., INC.

Worcester 1, Massachusetts

New York Philadelphia Detroit Akron Chicago
Atlanta Houston Tulsa Los Angeles Toronto

YOU MUSTN'T MISS—

Begins on page 198

TIMELY HINTS

The Plant Visit: Future Style

Here's a good way to take your visitors on a plant tour with the greatest of ease—for everyone. Stockholders of the Foote Mineral Co., Exton, Pa., sat comfortably in the plant cafeteria, and got the inside picture of company operations over television. Four TV cameras and 10 receivers did the job.

Standardization to Ease Handling

How do you keep a large fleet of old-type fork lifts, conveyors, cranes, and tractors operating when each piece of equipment is a different make and model? The U. S. Military's answer: You can't maintain the "cats & dogs"—as the services call the outdated equipment—so you replace them with standardized equipment as fast as possible. Under new government standards, 70 models will take care of all handling needs. Prior to adoption of the standard the government had 300 different models made by 30 manufacturers. Present equipment will be used until it's economically advisable to replace. So gradually the modern, standardized machines will take over. **Expected results** · Maintenance personnel will be more efficient, since they'll be required to work on less than a fourth the number of models they had before. And the Air Force alone estimates it will save approximately $15-million a year in spare parts and labor.

Turn the page

THE *Workhorse* OF SMALL GRINDERS

Aro Short Grinder Model 7149, 17,000 R.P.M., in airframe assembly work at Rohr Aircraft.

ROHR AIRCRAFT
Steps-up Production with ARO

You can't beat 'em for "workhorse jobs" in grinding, polishing, filing . . . ARO does it *faster* . . . at *lower cost!*

That's why Rohr Aircraft at San Diego—and hundreds of other progressive plants today—prefer ARO. Complete line grinders for jet engines . . . also heavy duty vertical and horizontal grinders of all types. Write for new catalog 60. The Aro Equipment Corp., Bryan, Ohio. Aro Equipment of Canada, Ltd., Toronto, Ont.

ARO AIR TOOLS

Also . . . LUBRICATING EQUIPMENT . . . HYDRAULIC EQUIPMENT . . . AIRCRAFT PRODUCTS . . . GREASE FITTINGS

THE ARO EQUIPMENT CORPORATION, BRYAN, OHIO

Without obligation please send the new ARO tool catalog No. 60.

Name_____

Company_____

Street_____

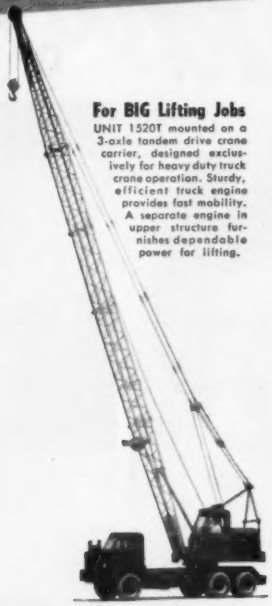
City_____ State_____

You Can Judge a Machine by the Calibre of its Users!

In every section of the country . . . in every branch of industry . . . you will find satisfied owners and operators of UNIT equipment. Surely, such widespread popularity must be deserved. Why not investigate? Write for novel "TV" brochure that depicts the complete Unit line.

These Prominent Firms Use UNIT Cranes and Shovels

Allis-Chalmers Mfg. Co.
American Chain & Cable Co.
Baker Wood Preserving Co.
Burroughs Adding Machine Co.
Campbell Soup Company
Carnegie-Illinois Steel Co.
Chicago, Milw., St. Paul & Pac. R.R.
Chrysler Corporation
Consolidated Vultee Aircraft
Diamond Match Company
Dow Chemical Company
Frigidaire
General Electric Company
General Motors (Pontiac Div.)
Goodyear Tire & Rubber Co.
Great Lakes Steel Corp.
International Harvester
Niagara-Mohawk Power & Light
North Carolina Pulp & Paper
Northern Natural Gas Co.
Oliver J. Olsen Shipbuilding
Packard Motor Car Company
Pennsylvania Railroad
Pittsburgh Plate Glass Co.
R. J. Reynolds Tobacco Co.
Socony Vacuum Oil Company
Shell Oil Company
A. O. Smith Corporation
Universal Pictures, Inc.
Weyerhauser Timber Co.



For BIG Lifting Jobs
UNIT 1520T mounted on a 3-axle tandem drive crane carrier, designed exclusively for heavy duty truck crane operation. Sturdy, efficient truck engine provides fast mobility. A separate engine in upper structure furnishes dependable power for lifting.

UNIT 357 Self-propelled Mobile Crane with Magnet Lifting Scrap Iron.

Available in Crawler and Mobile Models . . . ½ and ¾ Yard excavators . . . Cranes up to 20 tons lifting capacities . . . Fully Convertible to all attachments.

UNIT CRANE & SHOVEL CORP.
6602 W. Burnham Street • Milwaukee 14, Wisconsin, U. S. A.

UNIT

SHOVELS • DRAGLINES • CLAMSHELLS • CRANES • TRENCHOES • MAGNETS

YOU MUSTN'T MISS—

Begins on page 198

Atoms (Under Control) Won't Hurt You

If you think that exposure to radioactivity—under proper control— is going to ruin your products, you've got another guess coming. Radioactive isotopes can actually preserve them if they're perishable. Columbia University researchers using huge doses of radioactivity have succeeded in keeping milk "fresh" for a month under ordinary refrigeration. What's more the exposure to the atoms—called cold sterilization—did not affect nutritive value or appearance. And no radioactivity remained with the treated milk.

How it works · Material to be sterilized is conveyed through a radioactive "oven" and out again. The radioactivity destroys bacteria and checks enzyme activity, most frequent causes of food spoilage.

This process works with other foods, drinks, and even drugs, according to Stanford Research Institute. But the institute adds that an undesirable off-taste flavor is often produced in irradiated foods. Scientists are working on that problem right now.

More 2-Way Radio for Industry

Figures released by the Federal Communications Commission reveal the steady and rapid growth of 2-way radio communication in the industrial field. Here is the tabulation of total numbers of industrial 2-way licenses in each field:

Field	Jan. 1950	Jan. 1951	Jan. 1952
Power	3173	4324	5561
Petroleum	1020	1970	3013
Special industrial	708	1024	2021
Low power industrial	47	119	189

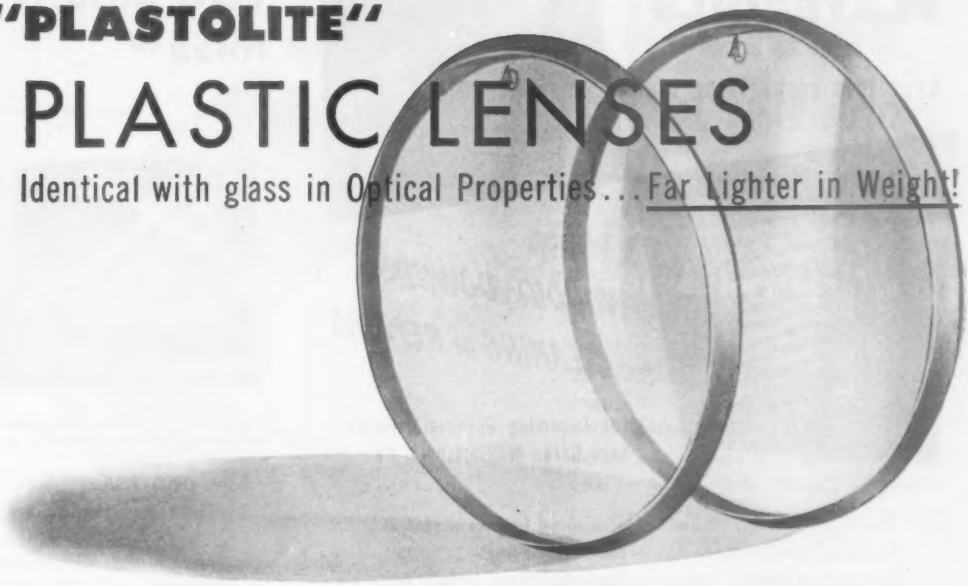
Turn the page

AO Announces

"PLASTOLITE"

PLASTIC LENSES

Identical with glass in Optical Properties... Far Lighter in Weight!



HERE IT IS...

the quality eye protection in plastic lenses many safety directors have wanted . . . the answer for workers who need protection but demand lightness heretofore unobtainable . . . the answer for companies who seek the enthusiastic cooperation of all exposed employees in cutting the high costs of eye accidents.

Made in the World's Cleanest Rooms!

Interested in plastic for years, AO has conducted constant research both in the protective properties of this material and in the atmosphere, facilities and controls required to assure maximum quality in the manufacturing process. In a new safety plant section at Brattleboro, Vermont, where Plastolite plastic lenses are made, all foreign matter is excluded which might impair the quality. Not only are the premises dust-free, lint-free and air conditioned—the workers wear special clothing! What's more, AO Plastolite lenses undergo a multitude of tests and inspections. Result: lenses with the optical properties traditional with AO that conform to the highest known standards!

RECOMMENDED USES:

For workers exposed for long periods . . . women workers . . . supervisors, foremen, plant visitors. Especially desirable for electronics work and spot welding. AO Plastolite lenses provide excellent protection against impact particularly where flying particles are small and acid exposures are no problem. NOTE THE LIGHT WEIGHT OF THESE LENSES *IN YOUR HANDS* AND *OVER YOUR EYES!*

AVAILABLE ON YOUR FAVORITE AO GOGGLE

AO Plastolite lenses are available as 6 curve lenses in all eye sizes on your favorite AO safety goggle. Your nearest AO Safety Products Representative can supply you with this outstanding advance in eye protection.

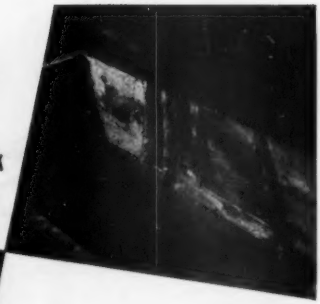
AO's Industrial Vision Program Increases Production, Decreases Accidents. Write today for booklet "Improved Industrial Vision."

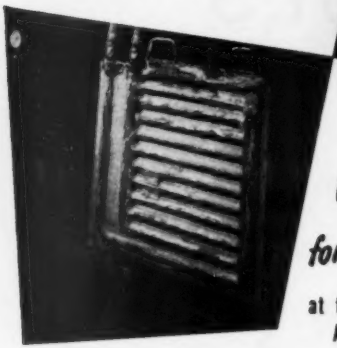
American Optical Company
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

PLATECOILS
(REPLACE PIPE COILS)

heat this parkerizing tank





WITHOUT DOWNTIME for CLEANING or REPAIRS

at the Lycoming Spencer Division
Avco Corp., Williamsport, Pa.

The only time this Platecoil was removed in over a year at Lycoming Spencer was to take its picture. The single 22" x 23" Platecoil has heated a 100-gallon Parkerizing tank, in daily use, *without downtime.* Built of Electro-polished Stainless Steel, the Platecoil has required *no cleaning or repairs.* Any deposit that builds up on the coil during the course of operation is "shocked off" when the steam pressure is dropped in the coil.

Notice how easy it is to lift the Platecoil out of the tank when the time comes that it does have to be cleaned, repaired or replaced. There are just two connections to loosen and both are outside the solution. The Platecoil merely is lifted out of the tank and replaced with little or no delay in production.

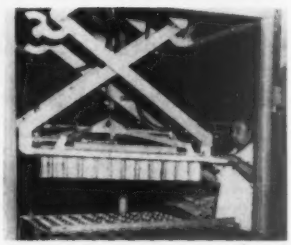
Platecoils have other advantages, too. They have about twice the heating area for a given space than can be obtained with pipe coils. Thus smaller size Platecoils can be used to save initial cost, tank space and handling time.

Learn how you can cut your heat transfer costs by sending today for Platecoil bulletin No. 60.

PLATECOIL
KOLD-HOLD MFG. CO.
LANSING 4, MICHIGAN

YOU MUSTN'T MISS—

Begins on page 198



A PALLET'S WAITING for this payload. And a Hawaiian Cannery found that a . . .

Tier-at-a-Time Speeds Palletizing

Stacking tin cans on pallets is easy and fast with an automatic tier-at-a-time palletizer developed by Hawaiian Canneries, Inc., Kauai, Hawaii. The company claims it will stack uniformly as many as 300 cans per minute. And a similar unit will depalletize up to 1000 cans per minute. The device will work with most common can sizes.

How it works · A suction head moves over the load, picks up tier after tier from the conveyor, and stacks them onto a pallet. The depalletizer works the same way. The suction head unloads the tiers from the pallet, and swings them onto a conveyor belt alongside.

Hawaiian Canneries, Inc., has 13 palletizers and 4 depalletizers in operation, and reports the following advantages:

- Reduced costs;
- More efficient use of warehouse space;
- Negligible maintenance requirements;
- No special skills needed for operation.

The equipment is licensed for manufacture by Standard-Knapp, division of Emhart Mfg. Co., Portland, Conn. *Turn the page*

It's EXTRAS like these

that enable IMPERIAL DISTRIBUTORS to offer you tube fittings that speed your work

Here are a few of the many Imperial EXTRAS in quality that help you get tubing connection jobs done easier, faster and simpler. They're EXTRAS that improve tubing jobs and add to all-around convenience in tubing work. When a distributor handles IMPERIAL you can be sure he handles the *finest in tube fittings.*

FITTINGS ARE FORGED*

- Forged fittings have *Greater Strength and Toughness.*
- They stand up better under pressure, vibration and shock.
- Denser grain structure means no chance of seepage.
- Greater uniformity means quicker, easier assembly. *Elbow and Tee Bodies.

TUBING SIZE MARKED ON NUT

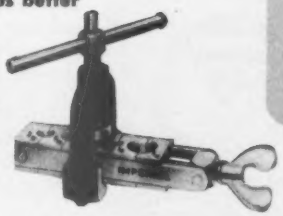
- Identifies fittings quickly . . . speeds and simplifies tubing jobs.
- Makes it much easier to find needed fittings in a hurry.
- Fittings are easier to sort and check.
- Teaches men to recognize fitting sizes.

LONG DRYSEAL PIPE THREADS

- A definite improvement in pipe threads.
- Longer on sizes ¼" and over.
- Provide extra assurance of tighter, stronger joints.
- Especially valuable in providing for additional takeup when reconnection is necessary.

Imperial Tubing Tools
Save you time — do jobs better

Imperial Distributors offer you tools for virtually any tubing connection job — cutting, flaring, double flaring, bending, reaming, swedging and pinch-off of tubing. Tools for copper, brass, aluminum, Bundyweld, JIC and other steel tubing.



Ask for Catalog No. 350
and Tube Working Handbook No. 369

THE IMPERIAL BRASS MANUFACTURING COMPANY, 517 S. Racine Ave., Chicago 7, Ill.
In Canada: 33 Church St., Toronto, Ontario

IMPERIAL

See Your Industrial Supply House

Pioneers in Tube Fittings and Tube Working Tools

30% PRODUCTION SAVINGS... with Jewel Brand Coated Abrasives!

BY SWITCHING TO JEWEL BRAND resin bonded abrasive belts, a manufacturer of cold rolled steel boxes for tools, first aid kits, electronic parts and similar equipment, made production savings of 30% in removing welding beads.

SAVINGS LIKE THESE are possible because properly chosen Jewel Brand Belts cut faster, last longer. And all Jewel Brand Coated Abrasive Belts have the exclusive *Velvet Joint* that eliminates bumping, adds many hours of productivity.

HELP YOURSELF TO SIMILAR SAVINGS by making the simple Waste Barrel Test. Send us a letter size sample (preferably including the joint) of a used belt taken from your waste barrel. In most cases, Jewel Brand Engineers can recommend a Jewel Brand Coated Abrasive Belt that will save time and money for you! No obligation of any kind.

Fill in coupon and send with used belt sample.

ABRASIVE PRODUCTS, INC.
519 Pearl Street
South Braintree 85, Mass.

Sure, we want to cut production costs! Enclosed is sample of used belt from our plant.

NAME.....

POSITION.....

COMPANY.....

TYPE OF PRODUCT..... MATERIAL.....

WE USE APPROXIMATELY..... BELTS PER MONTH.....

BELT LENGTH..... BELT WIDTH.....

YOU MUSTN'T MISS—

Begins on page 198

BOTTOM-FIRST unloading. That's one of the ideas American Cyanamid used in this . . .

Quick Way to Move Stockpiles

If you want to move that pile of raw material fast, why not put a trapdoor under it. American Cyanamid lets the bottom drop out of its storage rockpiles, and collects the rock fast on belt conveyors that run in a tunnel underneath.

The Brewster, Fla., installation, has also resulted in greater storage capacity, since bins formerly used permitted only limited storage. Other advantages of the system: less handling and more accurate blending of the different grades of rock.

How it works · Directly under each grade of rock in the storage pile are gates that open into an underground tunnel of reinforced concrete. You blend the different grades of rock by electrically controlling the gate openings. This allows the proper amount of rock from each pile to fall onto the moving tunnel conveyors. A rotary stacker reloads the rockpiles as they're reduced.

Automatic Batching Made Easy

Here's a good way to make batch-measuring automatic: Use a strain gage controller. United States Rubber Co. uses them in its Woonsocket, R. I., plant to in-

Model 3-427-45
For medium weight industrial equipment—capacity 300 lb. per caster

Model 5-807-15
Especially designed for heavy-duty industrial work —capacity 800 lb. per caster

Model 6-807-66
For extra heavy service. Made of heavy duty steel—practically indestructible

Load-Floating Colson® Casters

Make Old Equipment Roll Like New

For the price of new roll-easy COLSON casters and wheels you can change old bumpy, hard-to-push equipment to an efficient fast-rolling fleet. COLSON casters from 75 to 1500 pound capacity save you money by saving time and protecting your floors. Other cost-cutting materials-handling equipment by COLSON includes hand trucks, barrel and drum trucks, platform trucks and Lift-Jack Systems. Write us or consult the yellow pages of your phone book (under "Casters" or "Trucks: Industrial") for the COLSON office near you.

THE COLSON CORPORATION
ELYRIA, OHIO
CASTERS . . . . LIFT-JACK SYSTEMS . . . . INDUSTRIAL TRUCKS

Mail Coupon Today

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ELYRIA, OHIO

Please send free copy of 68 page catalog "Colson Casters".

Name_____

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City_____ Zone____ State_____

SHENANGO Centrifugal CASTINGS ... KEY TO SAVINGS

You'll do better

WITH SHENANGO

CENTRIFUGALLY CAST PARTS

HERE'S WHY . . . Shenango centrifugally cast parts offer many inherent advantages that can help you avoid trouble and save time and money.

For example, due to the centrifugal casting action, you get a more uniform, pressure-dense metal, free from sand inclusions, blow holes and other often-hidden defects. You get higher strength, greater wear resistance, better elongation—longer lasting parts, better able to withstand severe service of *any* kind.

So if your plans call for symmetrical shapes, anywhere from tiny bushings to huge rolls, ferrous or non-ferrous, rough or finished, check with Shenango. Company after company finds it a good way to do a better job at lower cost.

SHENANGO-PENN MOLD COMPANY
Centrifugal Castings Division
Dover, Ohio
Executive Offices: Pittsburgh, Pa.

SHENANGO

ALL RED BRONZES • MANGANESE BRONZES • ALUMINUM BRONZES
MONEL METAL • NI-RESIST • MEEHANITE METAL

YOU MUSTN'T MISS—

Begins on page 198

sure accurate batching of foam rubber products.

The company equipped each of eight 2000-gal. latex churns with resistance wire strain gages to indicate the weight of contents. When the churns are filled with a specified weight a controller cuts off a solenoid valve in the desired fill line.

Each strain gage load cylinder is 3⅜-in. diameter by 4-in. high. Baldwin-Lima-Hamilton Corp., Philadelphia, makes them.

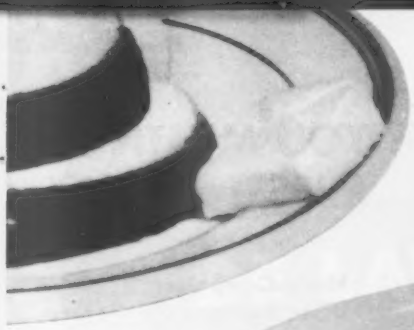
Seven Sins of Economic Education

It's not enough to start a program in economic education, says Thomas R. Reid, director of information, governmental affairs, Ford Motor Co. The important thing is to do it right. He lists potential pitfalls for any company program, calls them the seven "sins":

1. Find out what employees want, then try to tell them how they're going to get it.
2. Don't begin a program until you're sure that your employees are convinced the company is interested in their welfare.
3. Teach economics to employees from the worker's point of view, not the company's.
4. Don't expect the program to be smooth going all the way. When troubles arise, meet them squarely. Don't be disillusioned without giving the program a fair trial.
5. Don't buy packaged economic education programs. You'll want one that's tailor-made to meet all your individual company needs.
6. Don't kid yourself on results. Apply accurate, realistic methods to measure success.
7. Don't forget your follow-through. Economic education is not a one-shot proposition.

Turn the page

Does their soup warm you up?



SEAFOOD GUMBO is a popular heart-warmer of employees at Esso Standard Oil Co., Baton Rouge, La., where Crotty Food Service keeps everybody happy. Another example of how Crotty plans menus for local tastes and budgets.

Your employees' food can make you feel good, too. When its quality, quantity and service are right, it makes employees feel good and work better. It's free of the *hidden* costs of low morale and slow production.

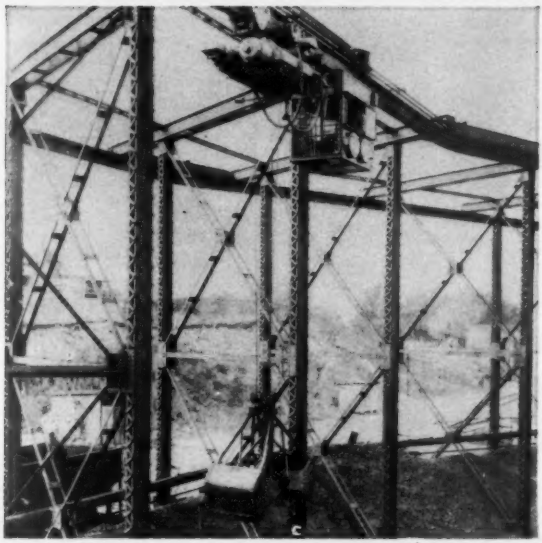
When Crotty moves in, hidden costs move out. Experts, backed by 21 years' leadership in employee feeding, take over full responsibility, consistent with your Company policy. You get the system that's best for you. Or your present installation wins new satisfaction. All *at lowest possible cost* to you and your employees.

WRITE FOR BOOKLET, "Employee Feeding Methods" and Operating Checklist. CROTTY BROTHERS, INC., 137 Newbury St., Boston 16, Mass. Operating in 16 States and 45 Cities.

CROTTY
BROTHERS, INC.

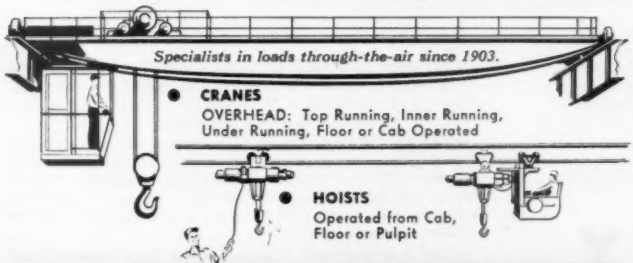
SINCE 1930...THE FOOD SERVICE MANAGEMENT THAT

keeps everybody happy



FAR ABOVE THE FLOOR, this Shepard Niles Crane moves loads along at high speeds. Travel is swift because there are no men, no machines or materials to block the way. Each load moves directly to its destination.

IT'S FASTER WHEN YOU HANDLE IT THROUGH THE AIR. Thrifty and easy, too. But which type crane is best suited for your use? The Shepard Niles representative in your area can guide you in your choice. He's a specialist in through-the-air handling — knows which crane will serve your plant best. Write Shepard Niles today for Bulletin 179 and arrange to have a representative call. No obligation, naturally.


Specialists in loads through-the-air since 1903.
● CRANES
OVERHEAD: Top Running, Inner Running, Under Running, Floor or Cab Operated
● HOISTS
Operated from Cab, Floor or Pulpit

SHEPARD NILES
CRANE AND HOIST CORPORATION
1114 SCHUYLER AVENUE • MONTOUR FALLS, N. Y.

YOU MUSTN'T MISS—

Begins on page 198

Many Companies Using Isotopes

Do you think that work on atomic energy is strictly for college professors and long-haired Ph.D.'s? Then you'll be surprised at the large number of companies that have decided to get in on the ground floor of the atom business.

If you want to find out what atomic energy can do for you, a good source of information is your nearest large university, or research organization. But if you want to learn which of your neighbor industries are actually using or thinking of using isotopes, take a look at the following list furnished by the Atomic Energy Commission. Companies are classified by states:

ALABAMA · **Reynolds Alloy Co.**, Listerhill.

CALIFORNIA · **C. F. Braun & Co.**, Alhambra; **Southwest Welding & Mfg. Co.**, Alhambra; **Fireboard Products, Inc.**, Antioch; **Union Oil Co.**, Brea; **North American Aviation, Inc.**, Downey; **Shell Development Co.**, Emeryville; **McCullough Tool Co.**, Los Angeles; **Western Precipitation Corp.**, Los Angeles; **X-Ray Products Corp.**, Los Angeles; **General Metals Corp.**, Oakland; **Radiographic Inspection Co.**, Oakland; **Rockwell Mfg. Co.**, Oakland; **Certain-teed Products Corp.**, Richmond; **Colloidal Products Corp.**, San Francisco; **Southern Pacific Co.**, San Francisco; **Western Waxed Paper Co.**, San Leandro; **Westinghouse Electric Corp.**, Sunnyvale.

CONNECTICUT · **Hartford Electric Steel Corp.**, Hartford; **American Cyanamid Co.**, Stamford; **Niles-Bement-Pond Co.**, West Hartford.

DELAWARE · **E. I. duPont de Nemours & Co., Inc.**, Wilmington.

GEORGIA · **E. V. Camp Steel Works**, Atlanta.

Turn the page

DE LAVAL
makes processes continuous and continuous means profitable

De Laval centrifugal machines speed up processing operations by making three types of separation continuous:

[redacted]

De Laval machines come in various sizes and models, but they all have certain advantages in common—they eliminate the costly delays that gravity or inefficient filtration methods require. Each one, whether it is a small Clarifier or a large "Nozzle-Matic" Separator, does its work in a relatively few seconds instead of minutes or hours.

Why De Laval?

De Laval has over 70 years experience in solving problems of separation and clarification. Your problem may be quite similar to one that has already been solved by De Laval centrifugals. It will pay you to ask.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL

for Speeding Production by **CONTINUOUS** *Separation and Clarification*

BYRON M. GLAD
Portland Manager

WILLIAM J. McELROY
President
and General Manager

GERALD T. KNOTT
Asst. General Manager

SEATTLE CHAIN & MFG. CO.

For nearly forty years, Seattle Chain has been growing with the great Pacific Northwest. This important plant not only manufactures and distributes heavy chain for the lumber, fishing and marine industries, but *all types* of welded and weldless chain, chain hoists, electric hoists, trolleys, winches, etc.

ONE OF THE COMPANIES THAT MAKE

Round CHAIN

The coast-to-coast Round organization is justly proud of Seattle Chain and of the men who manage it. In all parts of the United States, other Round Chain Companies are equally well qualified to supply *a complete line of chain* in their respective territories. Wherever you are, there's a Round Chain Company nearby *to serve you better.*

Welded and Weldless Chain for Every Need!

SLING CHAINS • LOG CHAINS • HOIST CHAINS
HOISTS • HOOKS • FITTINGS AND ATTACHMENTS

ORDER FROM YOUR DISTRIBUTOR, OR CONTACT ONE OF THE

Round CHAIN COMPANIES

YOU MUSTN'T MISS—

Begins on page 198

ILLINOIS · **American Scientific Co.**, Chicago; **Central Scientific Co.**, Chicago; **Griffin Wheel Co.**, Chicago; **Johnson & Johnson**, Chicago; **Nuclear Instrument & Chemical Corp.**, Chicago; **Thomas Moulding Floor Mfg. Co.**, Chicago; **Abbott Laboratories**, North Chicago; **Gunite Foundries Corp.**, Rockford.

INDIANA · **Edward Valves, Inc.**, E. Chicago; **Reynolds Metals Co.**, Gary; **P. R. Mallory & Co., Inc.**, Indianapolis; **U. S. Rubber Co.**, Mishawaka; **Standard Oil Co.**, Whiting.

IOWA · **Armstrong Rubber Mfg. Co.**, Des Moines.

KANSAS · **Locomotive Finished Material Co.**, Atchison; **Fluor Corp., Ltd.**, Paola.

KENTUCKY · **Grote Mfg. Co., Inc.**, Bellevue.

LOUISIANA · **Ethyl Corp.**, Baton Rouge.

MAINE · **S. D. Warren Co.**, Cumberland Mills.

MARYLAND · **Bethlehem Steel Co.**, Baltimore; **Revere Copper & Brass, Inc.**, Baltimore; **West Virginia Pulp & Paper Co.**, Luke.

MASSACHUSETTS · **L. I. Brown Paper Co.**, Adams; **Metal Hydrides, Inc.**, Beverly; **Mutual Boiler & Machinery Co.**, Boston; **Sylvania Electric Products, Inc.**, Boston; **Kelvin & Wilfred O. White Co.**, Boston; **Dewey & Almy Chemical Co.**, Cambridge; **Lever Bros. Co.**, Cambridge; **Arthur D. Little, Inc.**, Cambridge; **Chicopee Mfg. Co.**, Chicopee Falls; **Easthampton Rubber Thread Co.**, Easthampton; **Bird & Sons**, East Walpole; **Firestone Rubber & Latex Products Co.**, Fall River; **Raytheon Mfg. Co.**, Newton; **Plymouth Cordage Co.**, Plymouth; **Hood Rubber Co.**, Watertown; **General Electric Co.**, West Lynn; **Strathmore Paper Co.**, Woronoco, West Springfield.

MICHIGAN · **Ford Motor Co.**, Dear-

NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1952

WELDED DESIGN IMPROVES APPEARANCE

. . . while cutting costs 50%

BY converting to welded steel, this progressive manufacturer has achieved a more modern, better selling appearance for his products. At the same time he has cut costs 50% on some components.

Pleasing appearance in a product generally indicates efficient use of materials in its design. With welded steel, cumbersome and often costly dead weight, inherent with gray iron, is essentially eliminated. Wall thicknesses in steel are of exact design size. In addition, steel can be shaped at low cost with simple shop equipment.

While attaining stronger, more rigid products, in addition to improved appearance, savings in materials alone often run as high as 85%. Your Lincoln representative can show you how to apply the cost-saving benefits of steel to your products. Call or write.

Incentive Management—A thought-provoking approach to developing greater teamwork between employee and employer. Written by James F. Lincoln. Price only $1.00 postpaid in the U.S.A.; $1.50 elsewhere.

Fig. 3. Steel-Designed Blower *built by The Boardman Company, Oklahoma City, Oklahoma. Eliminates milling and drilling operations . . . is easier to clean and paint.*

PROPER DESIGN IN WELDED STEEL ALWAYS IMPROVES PRODUCT AND LOWERS COST

Fig. 1. Original Construction. *Required 41% more metal than present welded steel design. Heavier weight with gray iron added to handling costs in shop, in shipping and final installation.*

Fig. 2. Present Weldesign in Steel. *Saves 50% on cost. Has better appearance . . . greater selling appeal. Is stronger . . . more rigid.*

HERE'S MORE PROOF

Machine Design Sheets are available to designers and engineers. Write on your letterhead to Dept. 273

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 17, OHIO

The World's Largest Manufacturer of Arc Welding Equipment

it paid for itself in 22 days

THIS IS ONE OF 6 Tennant Sweepers used at Caterpillar. The first was bought 3 years ago.

TENNANT

POWER SWEEPER

THIS fast, heavy-duty TENNANT Power Sweeper cost $1985*. . . yet saved enough in manhours at Caterpillar Tractor Co. (Peoria) to pay for itself in 22 days.

These results were obtained in the Parts Department, where 12 men formerly swept aisles with push brooms. The saving, confirmed by time studies, amounted to more than 80 manhours per day.

CUTS COSTS IN MANY PLANTS

● **U.S. RUBBER** estimates mechanized sweeping can save up to $12,000 annually per machine. (They have 3 Tennant sweepers.)

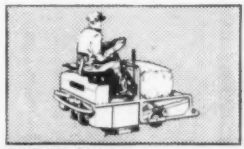
● **PAN AMERICAN** Airlines save approximately 75% in manhours by sweeping their warehouse floors in Miami with a Tennant Model 36 Power Sweeper.

● **WHITIN MACHINE** report making a net saving of several thousands of dollars in 10 months with a Tennant Power Sweeper.

*Smaller models available.

LET US ESTIMATE savings possible in your plant through mechanized sweeping. No obligation. Phone, wire or write!

SWEEPS CLEAN AT HIGH SPEED as 36" brush spins inside "sealed-to-floor" compartment. 11" fan controls dust. Removable hopper.



TURNS "ON A DIME." Easy-steering; easy to handle. Forward or reverse on single pedal.

G. H. TENNANT CO.
2554 North Second Street
Minneapolis 11, Minn.

TENNANT Established 1870

Write for illustrated bulletins and performance data; specify 36" or 24" sweepers. Also get FREE 16-page booklet, "New Ideas on Plant Sanitation & Maintenance."

INDUSTRIAL FLOOR MACHINES

CREATORS OF THE TENNANT SYSTEM OF FLOOR MAINTENANCE—MANUFACTURERS OF EQUIPMENT AND MATERIALS FOR MAINTENANCE OF FLOORS, DECKS, ROOFS, HIGHWAYS
OFFICES IN PRINCIPAL CITIES

YOU MUSTN'T MISS—

Begins on page 198

born; **Bendix Aviation Corp.**, Detroit; **Chrysler Corp.**, Detroit; **Detroit Edison Co.**, Detroit; **Radioactive Products, Inc.**, Detroit; **X-Ray Inc.**, Highland Park; **Dow Chemical Co.**, Midland; **Wyandotte Chemical Corp.**, Wyandotte.

MINNESOTA · **Minneapolis-Moline Co.**, Minneapolis; **Minnesota Mining & Mfg. Co.**, St. Paul.

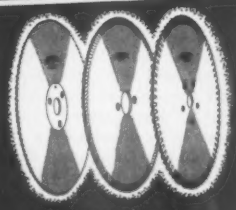
MISSOURI · **Midwest Piping Supply Co.**, St. Louis.

NEW JERSEY · **Peter J. Schweitzer, Inc.**, Elizabeth; **Crucible Steel Co. of America**, Harrison; **Cooper Alloy Foundry Co.**, Hillside; **General Foods Corp.**, Hoboken; **U. S. Testing Co., Inc.**, Hoboken; **Congoleum-Nairn, Inc.**, Kearny; **American Brake Shoe Co.**, Mahwah; **Riegel Paper Co.**, Milford; **Allied Chemical & Dye Corp.**, Morristown; **Bell Telephone Laboratories**, Murray Hill; **American Steel Foundries**, Newark; **Federal Telecommunication Laboratories**, Nutley; **Socony Vacuum Oil Co.**, Paulsboro; **Ingersoll-Rand Co.**, Phillipsburg; **Radio Corp. of America**, Princeton; **Merck & Co., Inc.**, Rahway; **Continental Paper Co.**, Ridgefield Park; **Wright Aeronautical Corp.**, Wood-Ridge.

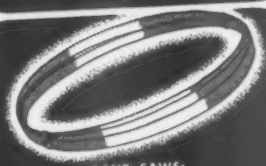
NEW YORK · **J. & J. Rogers Co.**, Ausable Forks; **Charles Pfizer & Co.**, Brooklyn; **Standard Rolling Mills**, Brooklyn; **Symington-Gould Corp.**, Depew; **Sun Chemical Corp.**, Long Island City; **Canadian Radium & Uranium Corp.**, New York; **John W. Meaker & Co.**, New York; **Radium Chemical Co., Inc.**, New York; **The Texas Co.**, New York; **Eastman Kodak Co.**, Rochester; **Linde Air Products Co.**, Tonawanda; **John A. Manning Paper Co.**, **Troy.**

OHIO · **Firestone Tire & Rubber Co.**, Akron; **General Tire & Rubber Co.**, Akron; **The B. F. Goodrich Co.**, Akron & Brecksville; **The Goodyear Tire & Rubber Co.**, Akron; **Babcock & Wilcox Co.**, Barberton; **Cincinnati Milling Machine Co.**, Cincinnati; **Kelley-Koett Instrument Co.**, Cincinnati; **Proctor**

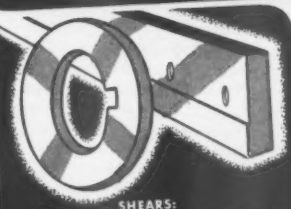
Here's a "Short" of SIMONDS Metal-Cutting Line



CIRCULAR SAWS:
Most complete line of types and sizes . . . Solid, Segmental, Inserted-Tooth, Carbide-Tipped, for cutting any type of metal faster, smoother, straighter.



BAND SAWS:
Regular Hard-Edge Band Saws, also Skip-Tooth, Hard-Edge, and Spring-Temper Band Saws . . . all 3 run more easily.

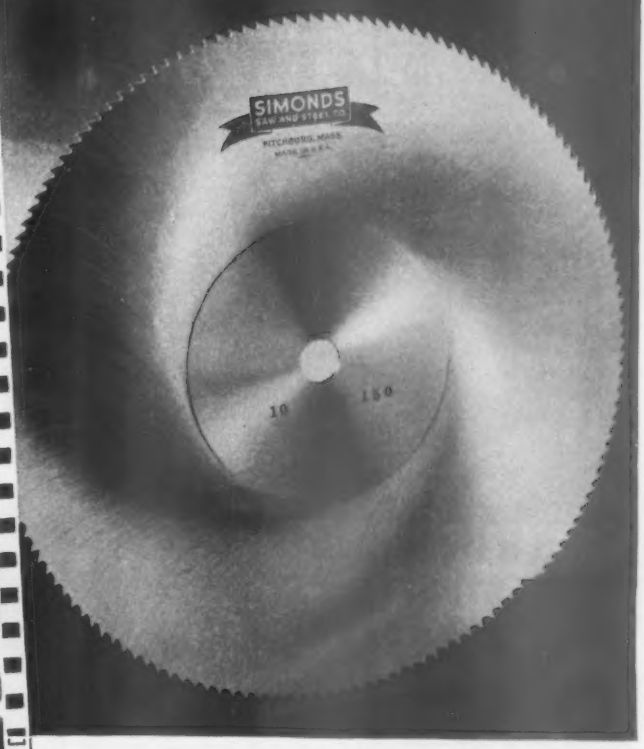


SHEARS:
"Red Streak" Rotary Shear Knives for clean cutting of strip or sheet . . . "Tungsweld" Squaring Shears give you sharp savings in cutting thin metal.

HACKSAW BLADES:
Famous "Red End" Blades for hand or power cutting . . . for top money's worth on any hacksaw job.

FILES:
Only Simonds "Red Tang" has the teeth like a metal-cutting saw . . . teeth that remove more metal with less effort.

for ALL NON-FERROUS CUTTING



On all non-ferrous metals, here's the toughest, most "stand-up-and-take-it" saw made . . . with a proven production record on everything from light-wall sections to solids.

SIMONDS heat-treats these saws for individual applications, according to speed, type of material, and machine. And SIMONDS design assures top cutting efficiency . . . with correct tooth-shape that eliminates clogging of gullets . . . with high, smooth finish that resists adherence of chips to plate . . . and with proper clearance for freer, cooler, straighter cutting.

Standard sizes are immediately available from stock . . . so see your Simonds Distributor *today*.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago
San Francisco and Portland, Ore. Canadian Factory in Montreal, Que.

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"One Armed Bandit" that pays off...

MODEL H SCOOPMOBILE
FULL HYDRAULIC
FRONT END LOADER

Shovel, Load and Transport
All Types of Bulk Material

The Model H SCOOPMOBILE with full hydraulic steering lift and bucket control is an outstanding material handler. Built for hard work, it gives top performance under all conditions. Planetary drive with 3-to-1 reduction ratio gives dependable power for all operations. Conveniently located finger-tip controls give the operator in cab full-vision command of every movement. Vickers hydraulic power steering gives positive control and lessens operator fatigue.

The versatile Model H SCOOPMOBILE with ¾ cu. yd. scoop has rated lifting capacity of 4,000 pounds and standard dumping height of 8 feet. Quick-change attachments include swivel-type concrete hopper, lift forks, special fertilizer or hay fork, and crane boom...and make the Model H SCOOPMOBILE an efficient multi-purpose unit.

EXTRA-LOW IN INITIAL COST... EXTRA-HIGH IN EFFICIENCY

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YOU MUSTN'T MISS—

Begins on page 198

& Gamble Co., Cincinnati; **Brush Development Co.**, Cleveland; **National Carbon Co., Inc.**, Cleveland; **Republic Steel Corp.**, Cleveland; **Industrial Nucleonics Corp.**, Columbus; **Monsanto Chemical Co.**, Dayton; **Champion Paper & Fiber Co.**, Hamilton; **Armco Steel Corp.**, Middletown; **Hoover Co.**, North Canton; **Farrett-Cheek Steel Co.**, Sandusky; **Ohio Steel Foundry Co.**, Springfield; **Youngstown Sheet & Tube Co.**, Youngstown.

OKLAHOMA · **Phillips Petroleum Co.**, Bartesville; **Continental Oil Co.**, Ponca City; **Dowell, Inc.**, Tulsa; **National Tank Co.**, Tulsa; **Electric Steel Foundry**, Portland.

PENNSYLVANIA · **Western Electric Co.**, Allentown; **U. S. Radium Corp.**, Bloomsburg; **Corning Glass Works**, Bradford; **Baldwin Locomotive Works**, Burnham; **Penn Steel Castings Co.**, Chester; **Pittsburgh Plate Glass Co.**, Creighton; **General Aniline & Film Corp.**, Easton; **Erie Resistor Corp.**, Erie; **Walworth Co.**, Greensburg; **Armstrong Cork Co.**, Lancaster; **Atlantic Refining Co.**, Philadelphia; **Gimpel Machine Works, Inc.**, Philadelphia; **Gulf Research & Development Co.**, Pittsburgh; **Jones & Laughlin Steel Corp.**, Pittsburgh; **United States Steel Corp.**, Pittsburgh; **Duraloy Co.**, Scottsdale.

TENNESSEE · **Ross-Meehan Foundries**, Chattanooga; **Fairchild Engine & Airplane Corp.**, Oak Ridge.

TEXAS · **Magnolia Petroleum Co.**, Dallas; **Peerless Mfg. Co.**, Dallas; **A. Gunthard Co.**, Ennis; **Federal Steel Products Corp.**, Houston.

VERMONT · **Gilman Paper Co.**, Gilman.

VIRGINIA · **Newport News Shipbuilding & Dry Dock Co.**, Newport News; **Froehling & Robertson, Inc.**, Richmond.

WASHINGTON · **Atlas Foundry & Machine Co.**, Tacoma.

Turn the page

These big, rugged, heavy-duty
MICRO-LIMIT Precision Switches
are adaptable to all types of industrial equipment

MICRO 1 ML1—Adjustable roller arm actuator switch. Field adjustable to any of four positions. Roller arm assembly adjustable to any of 870 positive lock positions through 360 degrees at intervals of 0.4 degrees.

MICRO 2 ML1—Heavy duty plunger actuator switch. Gives long, accurate repeatability in severe limit of motion service. Pre-travel is limited to .025 inch and the Differential travel is a maximum of .005 inch.

MICRO 5 ML1—Roller plunger actuator switch. Roller plunger is mounted in the top of the plunger. Actuator head can be rotated 90°; means of actuation may approach from any of four directions.

● Plant engineers who are looking for sturdy, heavy-duty precision switches for limits, safeties and interlocks on all types of plant machinery will find these Type "ML" MICRO-LIMIT precision switches will give long-life dependable operation.

The enclosures and the basic switches are the same on all three models. The three different types of actuators, with their features of adjustability, make these switches easily adaptable to practically any heavy-duty use.

The roller arm switch is suggested for use with cams or, because of its highly flexible adjustment features, in places where it is difficult to locate the switch properly with relation to the driving means. The plunger actuator switch is for straight-line actuating force, the roller plunger switch for actuation by cams.

Plant engineers find their wide range of field adjustability of actuators makes them easily adaptable to all types of machinery and industrial equipment.

MICRO SWITCH Distributors are located in 122 cities to supply these and other MICRO precision switches for plant use. Look for them under "Switches, Electric" in your classified phone book.

Write for your copy of "MICRO TIPS" today

It's full of practical ideas. "MICRO TIPS" will be mailed to you regularly on request.

MICRO MS SWITCH

FREEPORT, ILLINOIS

MICRO Snap-Action Switches . . . Honeywell Mercury Switches

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A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

FERALUN

• takes punishment
• gives years of safety service

AB 107

Yes, Feralun treads, floor plates and thresholds take the pounding of heavy traffic in stride because this economical flooring material is *cast to last!* No matter where you put Feralun—on stairs, steps, walkways or ramps—it assures two-fold benefits:

1 **It protects against slips and falls.**
2 **It keeps doing this vital safety job for the life of the building.**

Reason? Feralun consists of a special cast iron matrix with a diamond-hard abrasive imbedded in the walking surface. Gripping action is provided by the abrasive, not by the scoring or indentations in the metal. ● Get the full story on Feralun. Find out why millions of feet of this long-lasting anti-slip flooring are now in use.

BULLETIN 4k Am *contains complete data* **WRITE TODAY** *for your copy*

AMERICAN ABRASIVE Safety Floorings

AMERICAN ABRASIVE METALS CO.
460 COIT STREET, IRVINGTON 11, NEW JERSEY

YOU MUSTN'T MISS—

Begins on page 198

WEST VIRGINIA · **Weirton Steel Co.**, Weirton.

WISCONSIN · **Appleton Coated Paper Co.**, Appleton; **Thilmany Pulp & Paper Co.**, Kaukauna; **Marathon Corp.**, Menasha; **Allen-Bradley Co.**, Milwaukee; **Grede Foundries, Inc.**, Milwaukee; **Milwaukee Gas Specialties Co.**, Milwaukee; **A. O. Smith Corp.**, Milwaukee.

QUOTES

What's Ahead in "Germanium Era"

"Let us next take a look at where we are now in this so-called 'Germanium are.' . . . . A really personal radio of hearing-aid size running indefinitely on one set of batteries is within sight. The "Dick Tracy" wrist watch 2-way radio is no longer possible only in the comic books."—*J. Kaar*, manager of engineering, Electronics Div., General Electric Co.

Let's Really Compete for Employees' Minds

"In your own plant you compete for the minds of your employees, subject to all manner of propaganda from many sources. . . . How much money do the unions collect from your employees year after year? How does your own appropriation for counterattack compare with that amount?

"We have at hand means of communication, universal and all-persuasive. . . . Badly as we have used them in the past. . . our marvelous facilities for communication may be the means of our salvation."—*Louis Ruthenburg*, chairman, Servel, Inc.

Seals OUT TROUBLE!

SKF Red Seal bearings

1 Seal is stable DuPont Fairprene, unaffected by petroleum-base lubricants, normal operating temperatures, or ageing.

2 Seal, extending below steel retaining ring, forms a flexible lip which lightly touches a smooth, uniform chamfer of the inner ring. This exclusive design provides effective sealing with extremely light contact, hence low friction.

3 Circular-formed ribs around the retaining rings provide great rigidity. Thus, seal contact can be light, yet certain under all operating conditions.

4 Retaining ring is staked securely during manufacture—stays put for the life of the bearing.

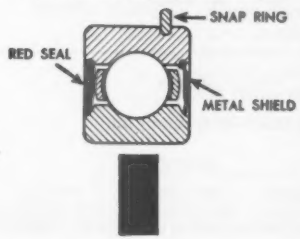
5 Lubricated at the factory.

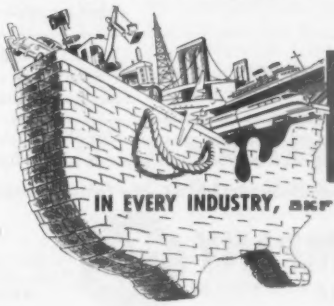
PROVED IN SERVICE - - -

Machine designers know they are competitively priced—all are interchangeable with conventional non-sealed bearings. Because SKF pioneered in the sealed-bearing field—the first to incorporate effective seals within the standard SAE width bearing—designers have come to depend on this store of engineering knowledge built into each Red Seal Bearing. They know, too, that the team-work of SKF field-engineers and design-engineers at SKF's headquarters are theirs for the asking.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.—*manufacturers of* SKF *and* HESS-BRIGHT *bearings.* 7308-A

RED SEALS ARE ALSO AVAILABLE WITH SNAP RINGS AND METAL SHIELDS—ANY COMBINATION OF THESE THREE FEATURES ARE AVAILABLE

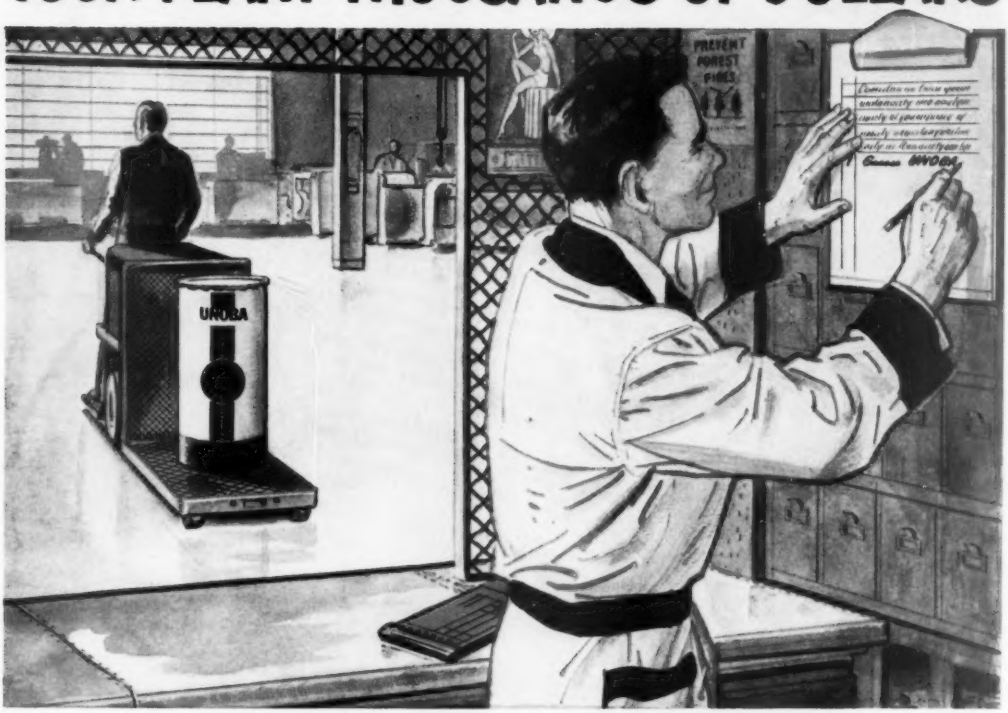




SKF®
BALL AND ROLLER BEARINGS

IN EVERY INDUSTRY, SKF Puts The Right Bearing In The Right Place

HOW ONE GREASE MAY SAVE YOUR PLANT THOUSANDS OF DOLLARS



UNOBA—the industry's *original* multi-purpose grease—may reduce your plant operating costs by thousands of dollars.

UNOBA WILL DO THIS . . . . . AND THIS IS WHY

UNOBA will simplify your lubrication.	In most cases only *one* grade of UNOBA and *one* gun are needed to lubricate an entire floor of machines.
UNOBA will lessen the chance of using the wrong lubricant at critical points.	Costly mistakes in grease lubrication are a thing of the past with UNOBA because it performs in the widest range of factory machinery and equipment.
UNOBA will reduce expensive grease inventories, lessen storage space.	UNOBA's flexibility permits you to concentrate your inventory to a single product for almost *all* your industrial lubrication.

Try this amazing multi-purpose grease in your plant machinery. You will experience a saving in actual dollars not possible with ordinary factory greases.

Developed by the manufacturers of T5X—the famous purple heavy-duty motor oil.

UNION OIL COMPANY OF CALIFORNIA 76

OFFICES

LOS ANGELES Union Oil Building
NEW YORK 4904 RCA Building
CHICAGO 1612 Bankers Building
NEW ORLEANS, 917 National Bank of Commerce Building

P&H

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ELECTRICAL EQUIPMENT

built—not borrowed—

FOR CRANE SERVICE

P&H Magnetorque* Control is the greatest crane improvement in 20 years. Get the facts about it!

*T. M. of Harnischfeger Corporation for electro-magnetic type brake.

Lifting and lowering heavy loads is the severe type of service that requires special motors, special controls and other electrical equipment designed for this specific purpose. P&H knows this through long experience. That's why we build our own and recommend it to you. With P&H electrical equipment, you may be sure your crane is a balanced unit, perfectly coordinated, job engineered in every detail for your requirements. Wise crane buyers know this and specify P&H electrical equipment on their overhead cranes. It means better service, too, with no buck-passing between the crane builder and outside suppliers. P&H — America's leading crane builder — takes the *entire responsibility!*

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Over 17,000 P&H cranes serve American industry — far more than any other

POWER SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FABRICATED HOMES

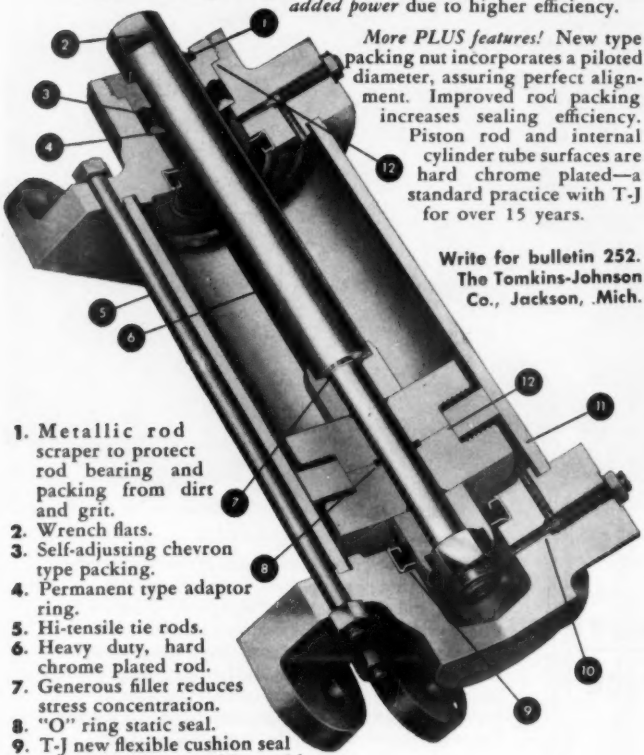
New Flexible Sealing...

T-J AIR CYLINDER

Designed with revolutionary application of

Super-Cushion

It's *sealed with pressure*—a revolutionary T-J application of flexible sealing that insures positive cushion action combined with automatic valving action for fast return stroke . . . eliminates binding and sticking . . . operates with *low friction, minimum wear,* and *added power* due to higher efficiency.



More PLUS features! New type packing nut incorporates a piloted diameter, assuring perfect alignment. Improved rod packing increases sealing efficiency. Piston rod and internal cylinder tube surfaces are hard chrome plated—a standard practice with T-J for over 15 years.

Write for bulletin 252. The Tomkins-Johnson Co., Jackson, Mich.

1. Metallic rod scraper to protect rod bearing and packing from dirt and grit.
2. Wrench flats.
3. Self-adjusting chevron type packing.
4. Permanent type adaptor ring.
5. Hi-tensile tie rods.
6. Heavy duty, hard chrome plated rod.
7. Generous fillet reduces stress concentration.
8. "O" ring static seal.
9. T-J new flexible cushion seal insures positive cushion with automatic valve action for fast return stroke. (Patent applied for)
10. Fine cushion adjustment.
11. Heavy wall precision honed hard chrome plate.
12. Controlled packing compression with metal to metal contact.

36 YEARS' EXPERIENCE T-J

TOMKINS-JOHNSON

RIVITORS . AIR AND HYDRAULIC CYLINDERS . CUTTERS . CLINCHORS

For copies of books and booklets reviewed, write directly to publisher listed

BOOKS

For Planners of the Factory of the Future

AMERICAN CAPITALISM

By John Kenneth Galbraith, Houghton Mifflin Co., 2 Park St., Boston 7. 208 pp. $3.

The factory of the future—and today—is built to exist in an economic climate. But today's climate draws angry words and prophecies of doom from both the liberals and conservatives—for different reasons, of course. Why?

Author Galbraith has an explanation that will interest anyone in industry who is doing serious thinking about the future of his plant, his industry, or his country.

Classical economics presupposes a peculiar type of competitive market. It has a vast number of buyers and many sellers whose independent actions combine to determine the price of goods, the supply of labor, etc.—and no buyer or seller alone can have much individual influence on the market. This is just not the condition today, says Galbraith. Yet economists continue to predict depressions, inflations, and market actions on the basis of this classic set of circumstances.

Instead Galbraith sees our system as one of "countervailing powers"—that is of counteracting forces that rise more or less automatically in our economy to balance out the power of the big buyers or sellers who tend to dominate a market or industry. How Galbraith goes on from there to plot the possible courses open to American industry makes interesting reading for every executive.

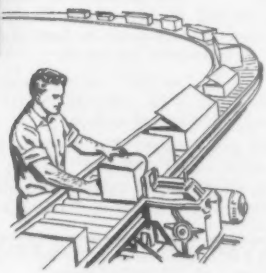
Turn the page

SIGNODE equipment boosts output of strapped packages 190 a day!

An eastern manufacturer, using Signode equipment, was turning out 560 packages every day. He was 100% satisfied. But the Signode field man in that territory wasn't. He was sure that he could step up the output of packages and reduce unit packaging costs with Signode's new Power Strapping Machine.

The Signode Power Strapping Machine was put in the production line. The number of packages strapped for shipment jumped from 560 to 750—190 more per day! Unit cost dropped. Yet, compared to many other Power Strapping Machine installations, this is not a particularly fast operation. In the flooring industry, for example, these machines apply up to 750 straps per hour.

Would you like to talk over your packaging and shipping needs with a Signode field man? No business is too small or too large — no operation too complex. Write



versatile!

Uniformity is the word that best describes the strapping operation performed by a Signode Power Strapping Machine. Each strap is applied perfectly straight with *exactly* the same predetermined tension—even though your containers may vary somewhat in size and shape. Result: every container looks neat and is securely protected.

SIGNODE STEEL STRAPPING COMPANY
2663 N. Western Avenue Chicago 47, Illinois
this seal means security in shipping

Offices coast to coast:
In Canada: Canadian Steel Strapping Company, Ltd.
Foreign Subsidiaries and Distributors world-wide.

NON-STOP
from tool room to press
VIA
RAYMOND
PLATFORM-TYPE
ELECTRIC TIERING TRUCK

- Now, load up the die in the tool room . . . go non-stop (up to 3⅓ mph) through narrow aisles and crowded production areas . . . and position it right at the machine with this RAYMOND Platform-Type Electric Tiering Truck! There'll be no wasted work-time, no halt in production because one man can do the whole job alone.
- Put this RAYMOND Tiering Truck to work on your production floor or use it for warehousing or shipping . . . it will go anywhere a hand truck will go!
- What's the secret? The truck's short length and patented* offset drive wheel with 200° turning arc. It features a patented* knee-action swivel caster to compensate for uneven floors . . . comes in both 2,000 and 4,000-lb. capacity models.

The RAYMOND CORPORATION
Formerly LYON-Raymond Corporation
3268 Madison St., Greene, N.Y.

Please send me Bulletin 710 on your Platform-Type Electric Tiering Truck. I'm interested in a demonstration: ☐ Yes ☐ No

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Bulletin 710 gives you the facts . . . send for it today! Ask to see the *RAYMOND* Platform-Type Electric Tiering Truck demonstrated.

* Patent No. 2,564,002

RAYMOND
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BOOKS

Begins on page 228

UNITED STATES AIR FORCE MACHINABILITY REPORT—1951

Published by Curtiss-Wright Corp., Wood-Ridge, N. J. Photos, charts, diagrams, tables. 196 pp. Free.

What's the best way to machine titanium, stainless steel, or high-temperature alloys and cast irons. These will be the materials you will be working with in the plant of the future. You're probably using some of them now. If so you will want to know the most efficient cutting techniques, tools, and heat treating methods that have been developed, in practice.

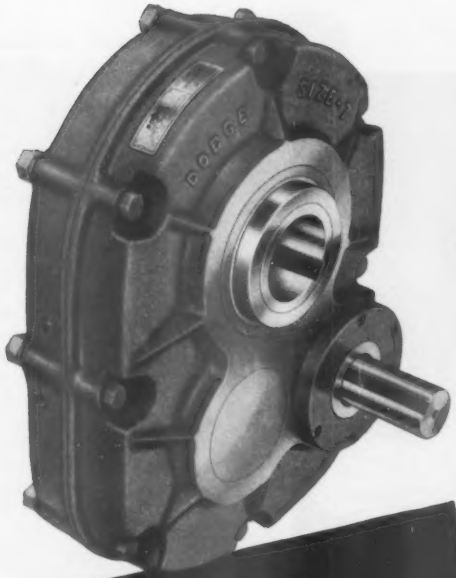
The full title of this report is, "Increased Production, Reduced Costs Through a Better Understanding of the Machining Process and Control of Materials, Tools, Machines." And that just about tells the story. It's the second in a series of reports that have grown out of an Air Force sponsored research program.

HANDBOOK OF ENGINEERING DATA FOR DESIGN ENGINEERS

Prepared for the Special Devices Center (U. S. Navy) by **Tufts College,** Medford 55, Mass. Diagrams, charts, tables, glossary, bibliographies, index. 500 pp. $6.75

In planning for the factory of the future, don't forget the people. Modern plant machinery has grown—and will continue to grow more efficient and automatic at a rapid pace. But the plant worker will continue to bring the same physical equipment to his job. It's a limited equipment, too—with a definite level of perception, endurance, and motor response. To overtax his physical equipment is to impair his efficiency and that of your plant.

"Human engineering," as used in this book, is the study



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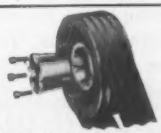

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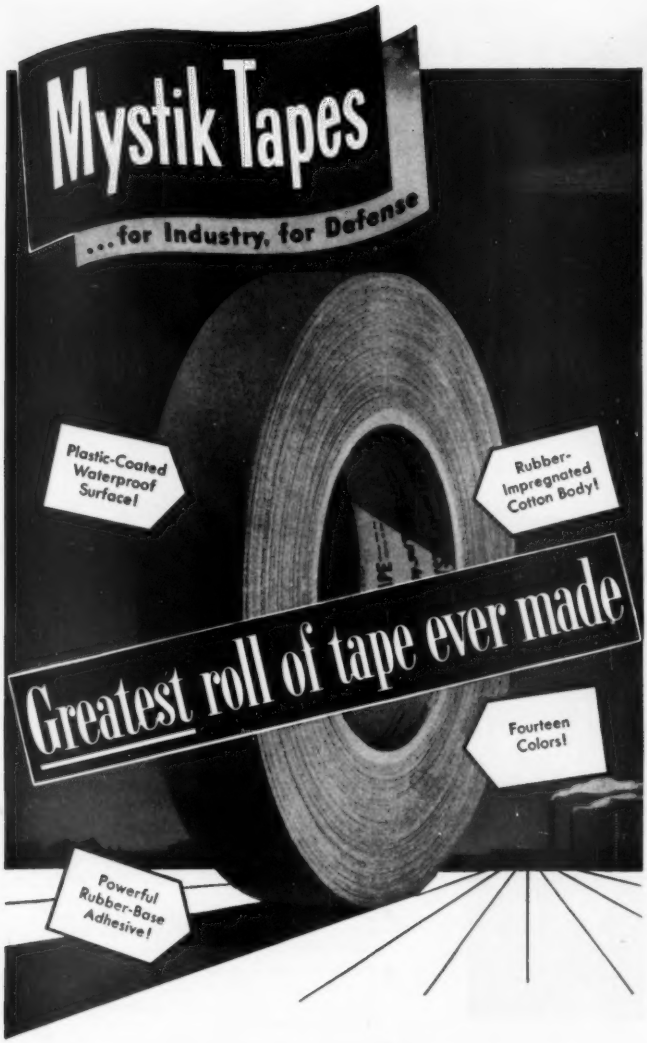

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BOOKS

Begins on page 228

of this interaction of men and machines. It's aim—to help the designer and user of new equipment to realize the full potential of men and machines. The tools it offers are a knowledge of man's physical limitations—how well he can see under certain lighting conditions, how well he can hear at a certain noise level, how long he can endure a continued strain, and how fast he can respond.

Basis for this report is a series of psychological tests begun during the war. It will be a continuing report. The present book has been published in loose leaf form to receive these future supplements.

THE HUMAN USE OF HUMAN BEINGS

By Norbert Wiener. Houghton Mifflin, Inc., 2 Park St., Boston 7. $3.

How will the factory of the future affect the community and its people? Will the trend to completely automatic operation displace great numbers of our working force? Professor Wiener thinks so. And feels that unless we prepare for that day intelligently, the automatic factory may be our undoing.

Prof. Wiener calls it the "second industrial revolution"—an industrial upheaval in which machines will replace not only those who "do" but also those who "think." His solution, greatly simplified, is a shift of emphasis from the machine to man. The science—Cybernetics—that he has created to meet this challenge of the automatic machine makes fascinating and not-too-difficult reading.

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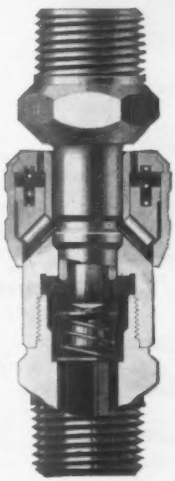

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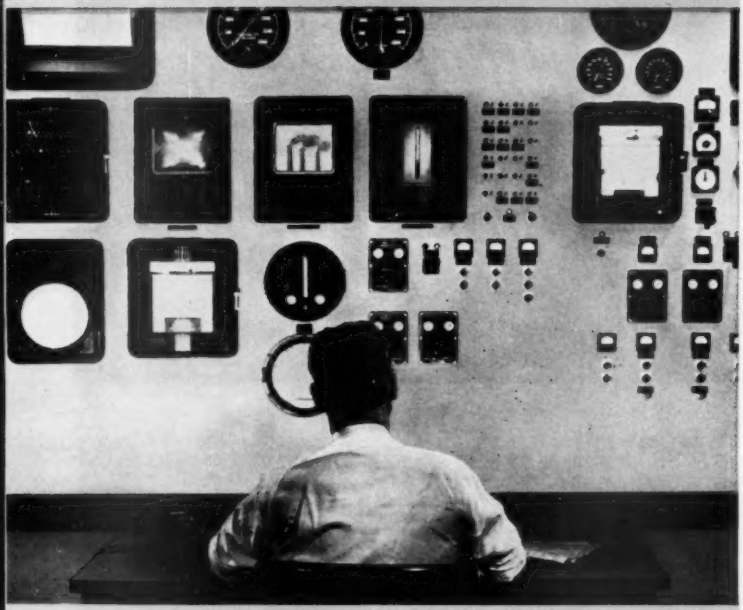

Operator in central control room of large power station "SEES WHERE HE CAN'T LOOK". Here he watches flame conditions in boiler furnace, stack smoke discharge, and water level in boiler on "Utiliscope" screens of control panel.

Centralized control is much more effective if it brings a SENSE OF REALISM into the control room . . . if the operator can actually see what is going on outside his range of vision instead of depending upon indirect interpretations of operating conditions. The electric power industry has accepted the "Utiliscope" as an important factor in achieving better centralized control (as shown above).

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Begins on page 228

MAKING THE AUTOMATIC FACTORY A REALITY Griffenhagen & Associates, 333 N. Michigan Ave., Chicago 1. An eye-opening report on what is *now* technologically possible in the way of automatic production. In it you'll find the full story of the automatic piston factory reviewed on page 74 of this issue. Diagrams. 71 pp. Free.

CATCHING UP ON ATOMIC ENERGY. Waddell & Reed, Inc., 40 Wall St., New York. A brief summary of atomic energy developments up to date with a valuable bibliography. 35 pp. Free.

INDUSTRIAL USES OF RADIOACTIVE FISSION PRODUCTS. Stanford Research Institute, Project 361, Stanford, Calif. A practical survey on the future of fission products in industry. The booklet lists potential uses, then justifies them on a cost basis. There's plenty of side material on the handling of radioactive products and related problems. And a thorough bibliography. Illustrated. 102 pp. $1.50.

THE SCIENCE OF PRECISION MEASUREMENT. The DoAll Co., Des Plaines, Ill. The fundamental "whys" and "wherefores" behind linear measurement — with emphasis on dimensional quality control. Plenty of photos and diagrams put across the principles of precision measurement in easy-to-take fashion. Glossary, tables. 256 pp. $3.50.

SAFE PRACTICES FOR WELDING AND CUTTING CONTAINERS THAT HAVE HELD COMBUSTIBLES. American Welding Society, 33 W. 39th St., New York 18. 12 pp. 50c.

Turn the page

This INVINCIBLE Flux Recovery Unit..
• SALVAGES VALUABLE WELDING FLUX
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Model 490, a compact unit designed for use with portable submerged arc welding equipment.

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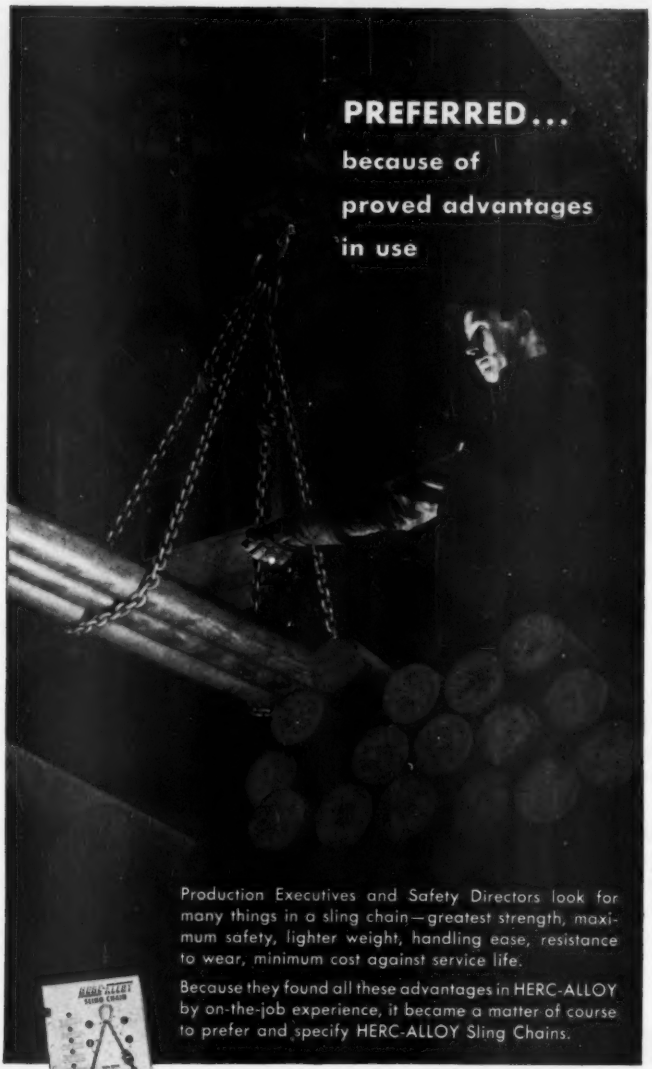

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INDUSTRIAL VENTILATION. Committee on Industrial Ventilation, P. O. Box 453, Lansing, Mich. Recommended practice in industrial ventilation from the standpoint of worker health. A thorough and practical study with plenty of illustrative diagrams. Extensive bibliography. 159 pp. $3.

BUSINESS CONSULTANTS — THEIR USES AND LIMITATIONS. Controllership Foundation, Inc., 1 E. 42nd St., New York 17. What a business consultant can and cannot do for you. When to use one. How to choose one. 31 pp. $3.

NEW SOLUTIONS TO PRODUCTION PROBLEMS. American Management Association, 330 W. 42nd St., New York 36. Brief reports on three new tools for increasing production—industrial operations research, predetermined motion-time values, and human relations research. 28 pp. Members, $1; non-members, $1.25.

RELIEVING THE ENGINEERING SHORTAGE American Management Association, 330 W. 42nd St., New York 36. Tells what's being done about it at Westinghouse, Rockwell Manufacturing, Commonwealth Edison, and Monsanto Chemical. 42 pp. Members $1; non-members, $1.25.

SURFACE TREATING GRAY IRON TO MEET SPECIFIC INDUSTRIAL APPLICATIONS. Gray Iron Founders' Society, Inc., 210 National City —E. 6th Bldg., Cleveland 14. By not using the low-cost coatings discussed here, you may be missing a good bet to increase the usefulness of gray iron products. Illustrated. 10 pp. 50¢.

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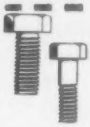

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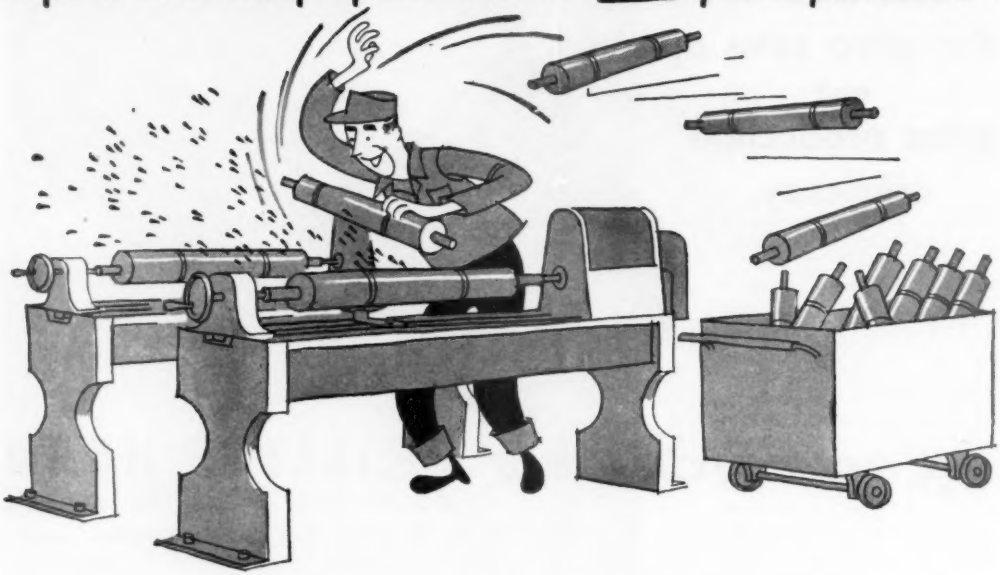

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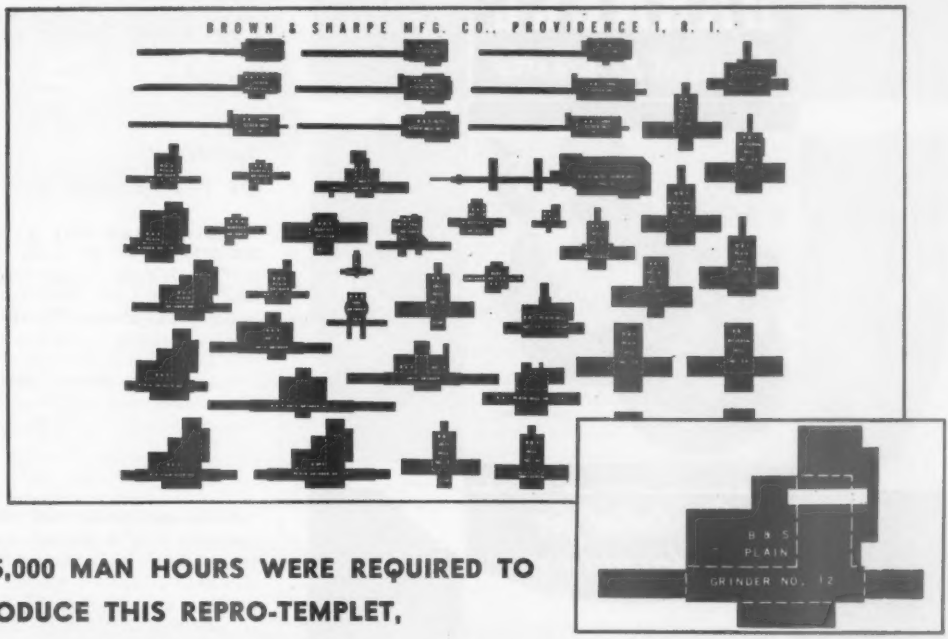

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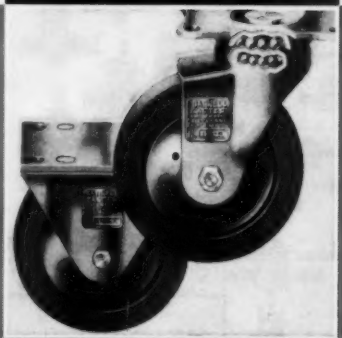

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"ENGINEERING FOR RADIO-ISOTOPES" shows the great engineering skill and resourcefulness that goes into the production of isotopes for industry. The 16 mm. black-and-white sound film runs 21½ minutes. For free loan write:

Public Information Service, U.S. Atomic Energy Commission, 1901 Constitution Ave., Washington, D. C.

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TO SAVE MORE LIVES

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"Only one part to handle in assembly means faster, easier attachments. SPEED NUTS are retained in screw-receiving position by finger-tip pressure—no wrench needed to pull down NUTS. *These advantages add up to savings of approximately .15 man-hours per hundred fasteners.*"

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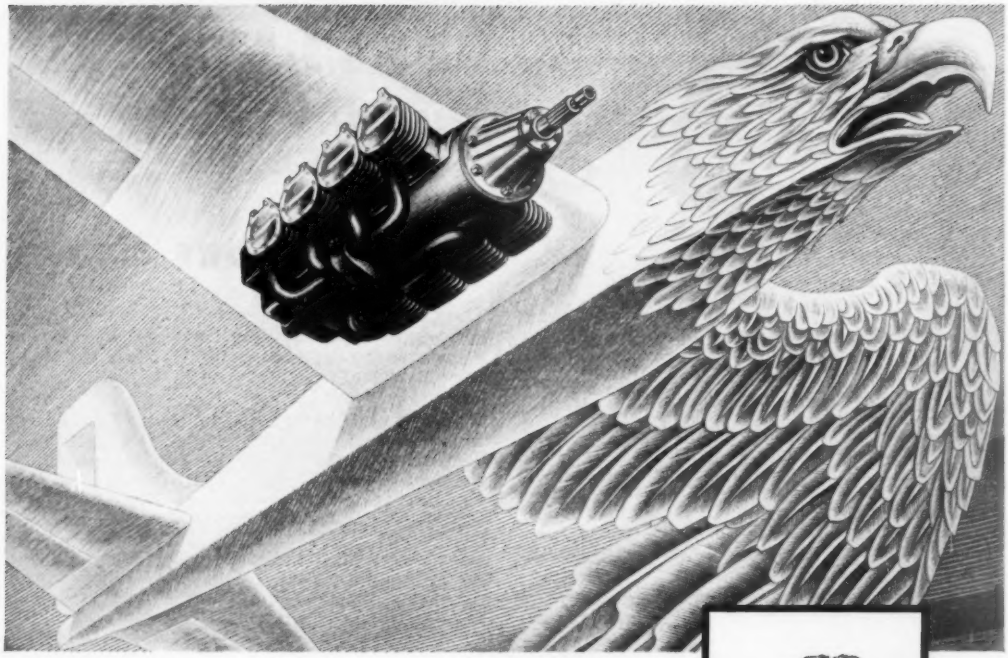
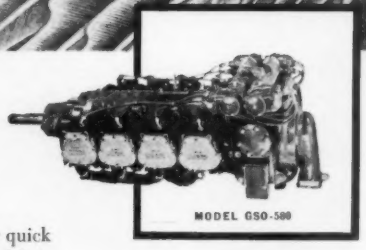
Upper plexiglas panel is attached to frame in HTK-1 Helicopter by means of Flat-Type SPEED NUTS and machine screws. Detail of vibration-proof assembly is shown below.
TINNERMAN



There's a new "beat" in this eagle's heart



A versatile aircraft engine with reserve power for quick take-offs, military hedge-hopping, more lift! *Geared* for smoother operation; "*opposed*" *design* for practical compactness; *supercharged* for greater power; the only 400-horsepower air-cooled engine being produced! That's the unique power plant now available through Lycoming research and precision production.

Whether you require air-cooled power for aircraft or ground applications—or whether your need is precision machining, product development, or high-volume production—Lycoming offers extensive facilities and well-rounded experience. Long famous for its aircraft engines, Lycoming also meets the most exacting and diverse requirements in many fields, both military and industrial.

Whatever your problem—look to Lycoming!

To put more "thrust" in aircraft calls for an engine with ready reserve power. Now, with a new "heart"—400-horse size—

Lycoming precision production gives extra power for peak performance.

AIR-COOLED ENGINES FOR AIRCRAFT AND INDUSTRIAL USES • PRECISION-AND-VOLUME-MACHINE PARTS • GRAY-IRON CASTINGS • STEEL-PLATE FABRICATION

LOOK TO **LYCOMING** FOR RESEARCH FOR PRECISION PRODUCTION

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BRIDGEPORT-LYCOMING DIVISION, STRATFORD, CONN.

AVCO MANUFACTURING CORPORATION

SINCE 1883

TROPICAL

heavy-duty

MAINTENANCE PAINTS

For Special Coatings, Industry has Depended on TROPICAL for 68 Years

Where service is severe, maintenance men have a habit of turning to Tropical heavy-duty paints. In almost any industry you can think of, from steel to textiles, and in commercial buildings and hotels, in schools, colleges, hospitals and institutions, Tropical paints have set records of endurance where the going is tough. Whether the application must resist acid fumes, alkalies, rust or heat . . . on metal, masonry, wood or concrete . . . on floors, walls, ceilings, roofs, machines or equipment . . . there is a Tropical paint *that has proved it can do the job better!* Take advantage of the experience, advice and personal service offered by your local Tropical maintenance paint specialist. Write us today.

Since 1883

HEAVY-DUTY MAINTENANCE PAINTS

TROPICAL®

SUBSIDIARY OF PARKER RUST PROOF COMPANY

MAKERS OF Bonderite QUALITY CORROSION RESISTANT

THOUSANDS OF PLANTS use TROPICAL

Where excessive heat, corrosion and fumes quickly destroy ordinary maintenance paints, Tropical has demonstrated superior durability. The list of applications where Tropical outlasts ordinary finishes is almost endless . . . steam pipes, boilers, stacks, pumps, storage tanks, pickling installations, steam chests, electrical equipment, structural steel and masonry. Tropical's heavy-duty paints, tailored to industry's needs, give outstanding service!

FREE! **Send for your free copy of the "Industrial Paint Index"—a quick, convenient reference chart for a multitude of maintenance paint applications.**

THE TROPICAL PAINT & OIL COMPANY • 1122-1298 West 70th St., Cleveland 2, Ohio

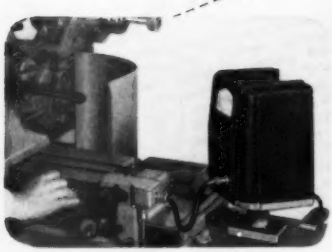
Build *"tenths of tenths"* measuring into your equipment

Versatile Brown & Sharpe Electronic Measuring Equipment is easily adapted to your machine or fixture design. It provides fast, accurate setting or gaging to .00001" *with human error practically eliminated.*

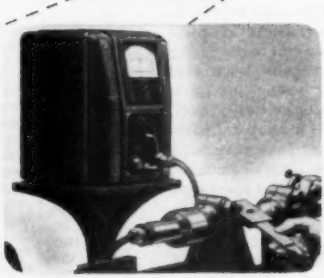
An outstanding advantage is the separate amplifier unit which isolates heat-producing elements, preventing temperature drift in gaging units. It's economical, too — you can design inexpensive Gage Head Cartridges into several fixtures and use the same amplifier for all of them. True linear response of the amplifier eliminates the need for "go" and "no go" masters — just "zero" the pointer on initial set-up and read variations directly from the accurately graduated dial.

These are but a few of the many advantages of Brown & Sharpe Electronic Measuring Equipment. Write for detailed Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

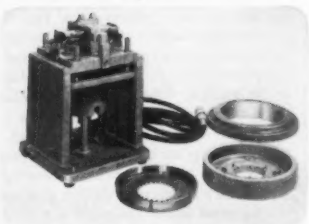
Brown & Sharpe Electronic Amplifier No. 950 for .0001" to .00001" readings. Gage Head Cartridge No. 953 is plugged in.



Electralign — an application of this precision electronic equipment in Brown & Sharpe's own grinding machines. Permits fast, accurate setting of swivel table for precision grinding straight work or exact tapers after a single trial grind.



Gage Head Cartridge No. 953 mounted on fixture to measure a fixed gage . . . used with Amplifier No. 950. Standard comparators for external or internal measuring also available.



Special fixture utilizes Gage Head Cartridge and Amplifier to measure internal angle accuracy to ± 1½ seconds independently of bore size and without reference to locating surface.

WE URGE BUYING THROUGH THE DISTRIBUTOR

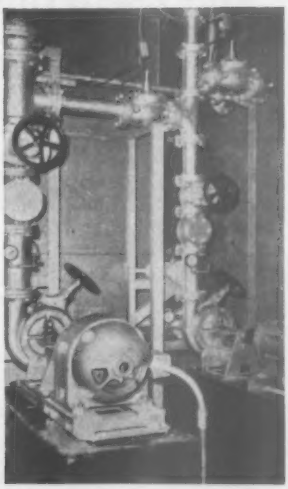
Brown & Sharpe B·S

There's a pumping expert near your plant who will gladly give you sound advice on any pumping problem. He's your Gardner-Denver field engineer—a man trained to help you plan good pumping installations—a man experienced in achieving dependable pumping that's easy on the power budget.

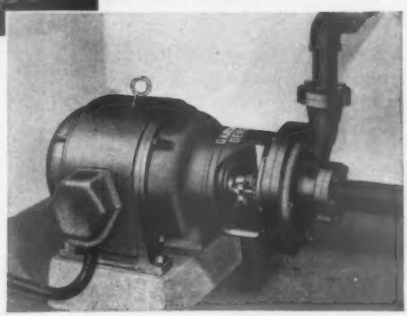
Write today for the name and address of the Gardner-Denver pumping expert nearest you.

▲ This constant water supply system depends on a heavy-duty Gardner-Denver Double-Suction Centrifugal.

▶ Here, Gardner-Denver Side-Suction Centrifugals boost line pressure to process requirements.



All types of Gardner-Denver Centrifugal Pumps are made in many sizes and capacities. That means you can easily get the right pump to meet your needs efficiently.



▶ For horizontal or vertical installations — the Gardner-Denver Close-Coupled Centrifugal.

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

Now! **KEX PUTS SAFETY MESSAGES RIGHT INTO YOUR EMPLOYEES' HANDS**

HERE'S AN ADDITIONAL KEX SERVICE that ties in with your *Safety Program*—flashes its messages to the employee right at a place *where accidents happen.* And builds better employee relations.

Now a percentage of KEX* towels have printed on them safety slogans such as—Work Safely—Apply More Caution; Alert Today—Alive Tomorrow; Always Alert—Nobody Hurt; to mention a few.

In these days when skilled hands are so important, KEX puts into them not only a wiping tool that does a faster, more efficient job, but which also helps protect them.

INVESTIGATE KEX NATIONAL SERVICE—the smooth-flowing service that means regular delivery of industrial wiping towels, in any desired quantity, that are hygienically clean, uniform in size, weight and quality, are highly absorbent, and simplify plant housekeeping.

No investment. Nothing to buy. Only a low rental charge per towel. *And your source of supply of KEX safety towels is automatically assured!* Look for your local KEX distributor in your classified phone book. Or write—

"KEX" NATIONAL SERVICE

*REG. U.S. PAT. OFF.

293 Fifth Ave., New York 16, N. Y.

Good Ways to Solve Special PLANT ENGINEERING PROBLEMS

You can get catalogs suggested as answers to these problems by using coupon on page B-124 or B-176, Part II.

NEED FASTER HEAT, HIGHER TEMPERATURE IN YOUR STEAM-HEATED EQUIPMENT? It may pay you to look over the Cochrane Corp. C-B system described in publication No. 3250. Shows how you can drain condensate from process equipment and discharge it directly to the boiler with substantial fuel savings. *(Circle No. 141 on coupon, page B-124 or B-176, Part II.)*

ARE ACID FUMES EATING UP YOUR EXHAUST DUCTS? Your troubles are over, says American Agile Corp. It offers custom-built exhaust systems fabricated from Polyethylene. Company says the plastic can withstand most acid fumes and outlive many other construction materials. *(Circle No. 142 on coupon, page B-124 or B-176 Part II.)*

NEED OUTDOOR PIPE INSULATION THAT WILL STAND UP? Reynolds Metals Co. claims it has two aluminum jacket materials that will provide all-weather protection for insulated pipes. Easy to apply and maintenance-free, according to bulletin No. BP-401-A. *(Circle No. 143 on coupon, page B-124 or B-176, Part II.)*

ARE YOUR ELEVATOR DOOR OPENINGS CAUSING LOST TEMPERS OR ACCIDENTS? Alexander Sill Co, tells how its drawbridge-like device provides a safe, smooth surface over the gap between elevator and floor. According to the company's bulletin, it also offers protection to elevator, door, floor, and merchandise. *(Circle No. 144 on coupon, page B-124 or B-176, Part II.)*

Turn the page

How HYSTER® turned Time into Money at PERVO

...it can happen in any manufacturing plant

CASE HISTORY:

PLANT: PERVO PAINT CO., Los Angeles, California, Paint and Varnish Manufacturer

EQUIPMENT: HYSTER 40 Lift Trucks (2) with 12-ft. lift

REPLACED: 2 wheel hand trucks

NATURE OF WORK: Loading, unloading, transporting raw materials and finished products in yard, storage and manufacturing areas.

RESULTS: 25% increase in production with same labor.

HYSTER®

It happens every time HYSTER Lift Trucks take over the materials handling job —better, faster production, smoother work flow, savings in time and money. Here's the HYSTER work picture at Pervo Paint—

1 Load of raw material for paint manufacture is removed from warehouse.

2 Pigment load is raised to high platform for charging pebble mills.

3 Transporting tub of paint (120 gal.) from pebble mill to canning department.

4 Load of raw materials for varnish manufacture being placed near cookers.

5 Ready to load "Good Neighbor Paint" on delivery truck.

Efficient results like these can be made in your plant, too, with HYSTER on the job. Ask a HYSTER dealer to make a materials handling study of your operation, or write for literature.

Hyster fork-type Lift Trucks, Turret Trucks, Straddle Trucks® and Karry Kranes® have capacity ranges from 1,000 lbs. to 30,000 lbs. They are sold and serviced by a world-wide Hyster dealer organization.

HYSTER COMPANY

THREE FACTORIES

2956 N. E. CLACKAMAS STREET, PORTLAND 8, OREGON
1856 NORTH ADAMS STREET.... PEORIA 1, ILLINOIS
1056 MEYERS STREET..... DANVILLE, ILLINOIS

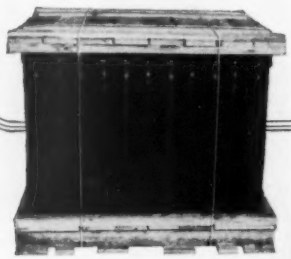
U·S·S Gerrard Steel Strapping fits all your tying jobs better!

● Gerrard Round Steel Strapping is versatile enough for all types of packing, from light cartons to large crates, from circular packages to odd-shaped bundles and heavy pallets.

Gerrard Strapping complies fully with Army-Navy specifications JAN-P-106A, JAN-P-107, and JAN-P-108 for overseas packing. It assures a tight, secure tie to final destination.

Call a Gerrard engineer for further information about the grade of Gerrard Round Steel Strapping and the type of Gerrard machine that will best fit your specific tying needs.

Model TI machine on suspension arm, securely ties two 16 ga. galvanized steel straps around a carton of powder. This method of closure permits re-use of carton many times.



Pallet reinforced with Gerrard Round Steel Strapping permits quick packing and easy handling of shell cases.

Gerrard Round Strapping permits a tight Diagonal Tie to give firm reinforcement to all 6 sides of a carton, increasing its strength and rigidity.

Lift truck handles building tile quickly. Note only the two top layers need be strapped to make a firm pallet that protects material and stacks safely.

U·S·S GERRARD ROUND STEEL STRAPPING

GERRARD STEEL STRAPPING DIVISION, UNITED STATES STEEL COMPANY

2927 West 47th St., Chicago 32, Ill.

USS

UNITED STATES STEEL

Begins on page 246

Good Ways to Solve Special PLANT ENGINEERING PROBLEMS

You can get catalogs suggested as answers to these problems by using coupon on page B-124 or B-176.

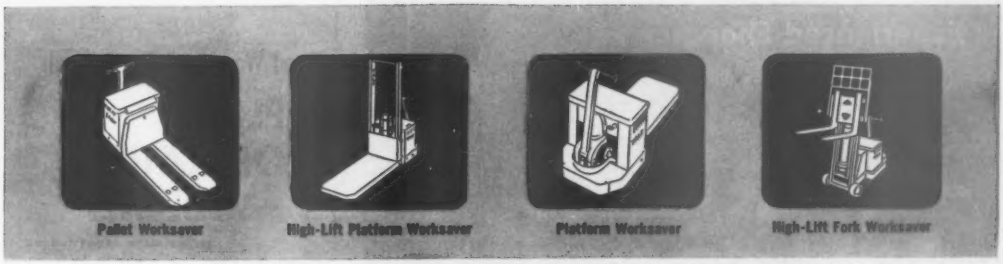
HOW TO GET FROM THREE TO TEN TIMES MORE SOFT WATER FROM YOUR PRESENT SOFTENER EQUIPMENT: This is part of a booklet (No. 611) on modernization of softener equipment. Elgin Softener Corp. adds its zeolite or installs its manfold system — or both. *(Circle No. 000 on coupon, page 000 or 000, Part II.)*

TO SPOT THE CAUSE OF MACHINE KNOCKS: Use an electric ear. Elec-Detec will locate trouble spots on machines in operation, says the American Name Plate & Mfg. Co. *(Circle No. 146 on coupon, page B-124 or B-176, Part II.)*

IS WET, DIRTY AIR FOULING YOUR PNEUMATIC CONTROLS? Condensi-filter, a single-unit filter, dehydrates and automatically drains off condensate. Hankinson Corp.'s bulletin No. B-30 describes how it removes foreign materials from the air. *(Circle No. 147 on coupon, page B-124 or B-176, Part II.)*

TO PROTECT YOUR PLANT FROM STATIC-CAUSED EXPLOSIONS: The Staticator will give audible and visual warning whenever static charges build up to a hazardous level. It will also detect the source of static generation. *(Circle No. 148 on coupon, page B-124 or B-176, Part II.)*

WANT TO MINIMIZE BREAKDOWNS ON HIGH-CYCLE HAND TOOLS? Rotor Tool Co.'s handy maintenance manual No. 39 tells you how to get the most out of electrical hand tools. Simple rules on inspection and maintenance. *(Circle No. 149 on coupon, page B-124 or B-176, Part II.)*



GET HEAVYWEIGHT SERVICE FROM WELTERWEIGHT TRUCKS

YALE *WORKSAVERS*

USE *WORKSAVERS*

in moves involving freight elevators. YALE WORKSAVERS **may be carried safely on the elevator with the load, eliminate reloading and relifting.**

USE *WORKSAVERS*

on low-load floors. Mechanize areas out-of-bounds to heavier trucks with speedy, dependable, low-cost YALE WORKSAVERS.

USE *WORKSAVERS*

in tight storage areas. They're easy to manage in narrow aisles; save time, cost and effort in moving and storage operations.

YALE WORKSAVER Electric Trucks lift, stack and carry loads up to 6,000 lbs., and may be used in many areas where weight or space rule out big-truck use. Low in initial cost, economical in operation, and simple for anyone to use—their performance meets the quality standards that industry identifies with YALE Industrial Trucks of every kind.

CALL YOUR YALE REPRESENTATIVE FOR A FREE WORKSAVER DEMONSTRATION

Get an eye-opening demonstration of rugged WORKSAVER performance. Be sure to ask about the famous WORKSAVER *Power Team*—Truck, Battery, Battery Charger. There's no obligation, of course.

MAIL THIS COUPON TODAY

The Yale & Towne Manufacturing Co., Dept. 34
Philadelphia 15, Pa.

I want to know how YALE WORKSAVERS can help me.

☐ Please have your local Representative call.
☐ Please send free copy of GEMS OF LOW COST MATERIALS HANDLING at once.

Company_____

Name_____ Title_____

Street_____

City_____ State_____

In Canada write: The Yale & Towne Mfg. Co., St. Catharines, Ont.

YALE & TOWNE

The Yale & Towne Manufacturing Co., Philadelphia 15, Pa.

YALE is a Registered Trade Mark of The Yale & Towne Manufacturing Co.

YALE GAS AND ELECTRIC TRUCKS • YALE HAND TRUCKS • YALE HAND AND ELECTRIC HOISTS

Experienced Shopmen say:

ONE LOOK AT A SUPREME BRAND CHUCK AND YOU KNOW IT'S QUALITY!

check these features by buying a SUPREME brand chuck the next time you order!

Entire chuck body is hardened inside and out.

Outer shell is smooth . . . an added safety feature.

Supreme brand chucks and keys are interchangeable with other makes.

Threaded nut and key driven gear are one piece.

Jaws are nickel chrome moly alloy steel, expertly heat treated and precision ground.

Each chuck individually tested for accuracy.

SUPREME brand chucks are top quality chucks that are selected by particular workmen because of their long life and dependable performance. One look at the workmanship and you know that they have been made with care. The best of materials go into Supreme brand chucks and every chuck is carefully checked for accuracy before it leaves the factory . . . this gives you assurance that you can use them with confidence.

When you buy chucks for replacement specify SUPREME brand . . . or in buying new equipment tell your supplier you would like to have it equipped with SUPREME brand chucks.

SOLD THROUGH DISTRIBUTORS

SUPREME BRAND **CHUCKS**

Supreme Products, Inc., 2222 South Calumet Avenue, Chicago, Illinois

THE CHUCK THAT LIVES UP TO ITS NAME...SUPREME

Good Ways to Solve Special

▶ PLANT OPERATING PROBLEMS

You can get catalogs suggested as answers to these problems by using coupon on page B-124 or B-176, Part II.

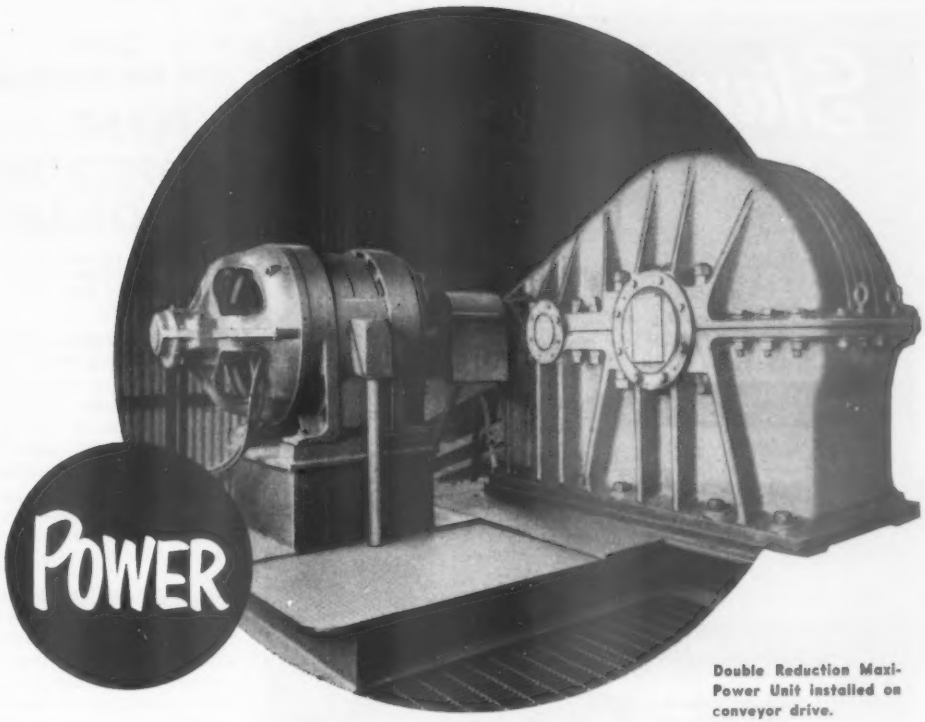
TOO MUCH PAPER WORK FOR QUALITY CONTROL? A continuous sampling monitor makes the work lots easier. Eliminates most of the routine computing and recording in continuous sampling, General Electric Co. says. Indicating lights signal the inspector to change from total inspection to sampling, and vice versa. Easy to install and use, according to G-E Bulletin No. 5627. *(Circle No. 150 on coupon, page B-124 or B-176, Part II.)*

TO GET UP TO DATE ON SMALL SHOP TOOLS: You may want to take a look at Brown & Sharpe Mfg. Co.'s new 224-page catalog. There's a complete line of small tools, instruments, cutters, and other shop items. Illustrations and specifications, price list, and section of useful tables. Catalog No. 35. *(Circle No. 151 on coupon, page B-124 or B-176, Part II.)*

IF YOU CAN'T GET THE BASIC MACHINE TOOLS YOU NEED, an abrasive-belt machine may fill the bill. Porter-Cable Machine Co. tells you all about abrasive-belt machining in a new 32-page booklet. Contains 46 case examples, describes five basic types of machining. *(Circle No. 152 on coupon, page B-124 or B-176, Part II.)*

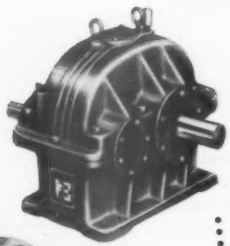
WASTE HIGH IN OFF-GAGE MATERIAL? Atomic energy may be just what you need, according to Industrial Nucleonics Corp. It claims its beta gage provides direct square yard weight readings of sheet materials moving on production lines. And with an accurracy of 1% or less. Bulletin No. R-52. *(Circle No. 153 on coupon, page B-124 or B-176, Part II.)*

Turn the page

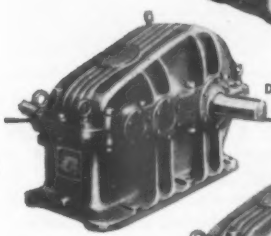


Double Reduction Maxi-Power Unit installed on conveyor drive.

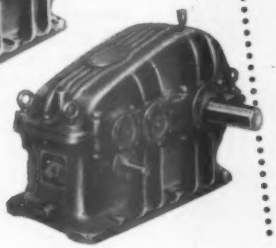
in minimum space with *Maxi-Power* parallel shaft drives



SINGLE REDUCTION



DOUBLE REDUCTION



TRIPLE REDUCTION

For heavy-duty applications, here is a drive that offers the maximum in sturdy, reliable service.

Precision generated helical gearing with uniform load distribution across the entire face means improved performance — permits maximum load-carrying capacity in minimum space.

Maxi-Power Drives are available in single, double and triple reductions in ratios from 2.08 to 1 up to 360 to 1 — capacities up to 1,550 h.p.

Mail the coupon for engineering bulletin on Maxi-Power Drives or call the Foote Bros. Representative near you.

FOOTE BROS. GEAR AND MACHINE CORPORATION
Dept. I, 4545 S. Western Blvd. • Chicago 9, Illinois

FOOTE BROS.

Better Power Transmission Through Better Gears

Foote Bros. Gear and Machine Corporation
Dept. I, 4545 S. Western Blvd., Chicago 9, Ill.

Please send Bulletin MPB containing full information on Maxi-Power Drives.

Name.....

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City.....*State*.....

Standardaire

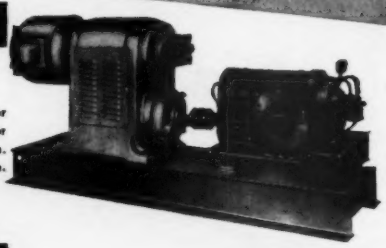
AXIAL FLOW POSITIVE PRESSURE

BLOWERS

provide air to the specific needs of many important industries because Standardaire Blowers are unique in design and construction—unequalled in quality and performance.

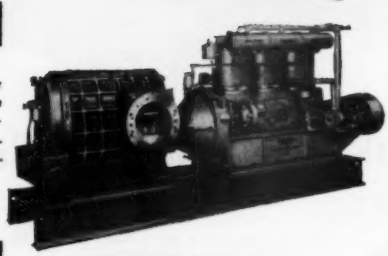
for CHEMICAL PROCESSING

Standardaire Blower with Varidrive Motor to deliver 780 c. f. m. at 1750 r. p. m.



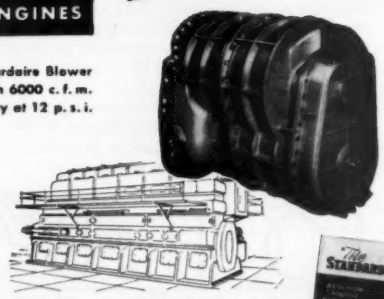
for SEWAGE PLANTS

Standardaire Blower with Climax Engine using sewage gas—to deliver 2100 c. f. m. at 720 r. p. m.



for DIESEL ENGINES

Standardaire Blower with 6000 c. f. m. capacity at 12 p. s. i.



AXIAL FLOW STANDARDAIRE BLOWER

Write DEPT. F47 for Publication No. 90

BLOWER-STOKER DIVISION

READ STANDARD CORPORATION

370 LEXINGTON AVE., NEW YORK 17, N. Y.

Begins on page 250

Good Ways to Solve Special

▶ PLANT OPERATING PROBLEMS

You can get catalogs suggested as answers to these problems by using coupon on page B-124 or B-176, Part II.

IF YOUR SOLDERING AND BRAZING COSTS ARE TOO HIGH, maybe a soldering gun can help lower them. Metallizing Co. of America makes one that it says will solder seams at speeds up to 200 lineal feet per minute—and save both labor and solder. An 8-page booklet tells how. *(Circle No. 154 on coupon, page B-124 or B-176, Part II.)*

TO BREAK BOTTLENECKS IN MASS-PRODUCTION HARDENING, JOINING, AND ANNEALING, radio-frequency industrion heating may be your answer. Westinghouse booklet No. B-4782 shows how you can use industrion heating to boost production and save time, space, and money. Lists case studies and features of this type of heating. *(Circle No. 155 on coupon, page B-124 or B-176, Part II.)*

GOT A TIME-TEMPERATURE CONTROL PROBLEM? Minneapolis-Honeywell Regulator Co. says its cam programmer thermometers can reduce initial instrument costs, centralize control in one instrument, and conserve space and manpower. Several different models for various instrumentation problems described in catalog No. 6020. *(Circle No. 156 on coupon, page B-124 or B-176, Part II.)*

NEED A MULTI-PURPOSE MACHINE TOOL THAT DOESN'T REQUIRE A SET-UP? DoAll Co. offers one in the new Contour-Matic. Uses all band machining tools that cut and shape materials formerly regarded as non-machinable, according to the company, and your operator need not have years of experience. *(Circle No. 157 on coupon, page B-124 or B-176, Part II.)*

Panel discussions on how casters help reduce the **"Reducible 30%"***

MATERIALS-HANDLING FORUM

Write us how you've used casters to solve specific handling problems. $25.00 will be paid for material used.

A SERIES PUBLISHED BY BASSICK, WORLD'S LARGEST MANUFACTURER OF CASTERS AND FLOOR PROTECTION EQUIPMENT

"FLOATING-HUB" WHEELS PROTECT LOADS

In Bassick's unique "Floating-Hub" construction, the caster wheel, spring-controlled, actually "floats" in the frame, providing mechanical resiliency between the rim and axle.

It makes trucks and portable equipment as easy riding as a fine automobile.

LIQUID SPILLAGE PREVENTED

Slosh and spill of liquids in food carts, portable plating tanks, etc., equipped with Bassick's "Floating-Hub," is minimized.

All Wheels in Contact with Floor at All Times

The "Floating-Hub" construction keeps all wheels in contact with the floor, even on rough bumpy surfaces. The result is an even load distribution and elimination of destructive caster shimmy.

GREATER SECURITY FOR EASILY-DAMAGED LOADS

The smoother, more even ride of "Floating-Hub" safeguards the movement of highly-finished auto bumpers, ceramic products, glass and china ware, loose loads of small parts... innumerable fragile loads.

Shock Absorption Important Advantage of "Floating-Hub"

The "Floating-Hub" rides with the punch, backs away with the blow and at the same time starts its climb. This unique ability reduces impact force. That's why it's vitally important on power-pulled trailer trucks.

Full details available upon request

Bassick's "Floating-Hub," in a wide range of sizes (6 to 16 in.) for a wide range of jobs, costs only slightly more than ordinary casters. Write for Catalog 124A. There is a local distributor of industrial supplies handling casters and wheels for every need. Factory engineering assistance readily available. THE BASSICK COMPANY, Bridgeport 2, Conn. *In Canada:* Belleville, Ont.

WEAR ON EQUIPMENT AND CASTERS IS REDUCED

With "Floating-Hub," there is less stress on trucks and dollies because the wheels absorb the bumps. There is less wear on floors because the "Floating-Hub," not the floor, takes the impact. The casters and the equipment last longer.

*According to cost analysts, materials-handling (about 30% of total cost) affords about the only real opportunities for cost reduction today.

Bassick
A DIVISION OF STEWART SW WARNER

MAKING MORE KINDS OF CASTERS... MAKING CASTERS DO MORE

We are leading a double life!

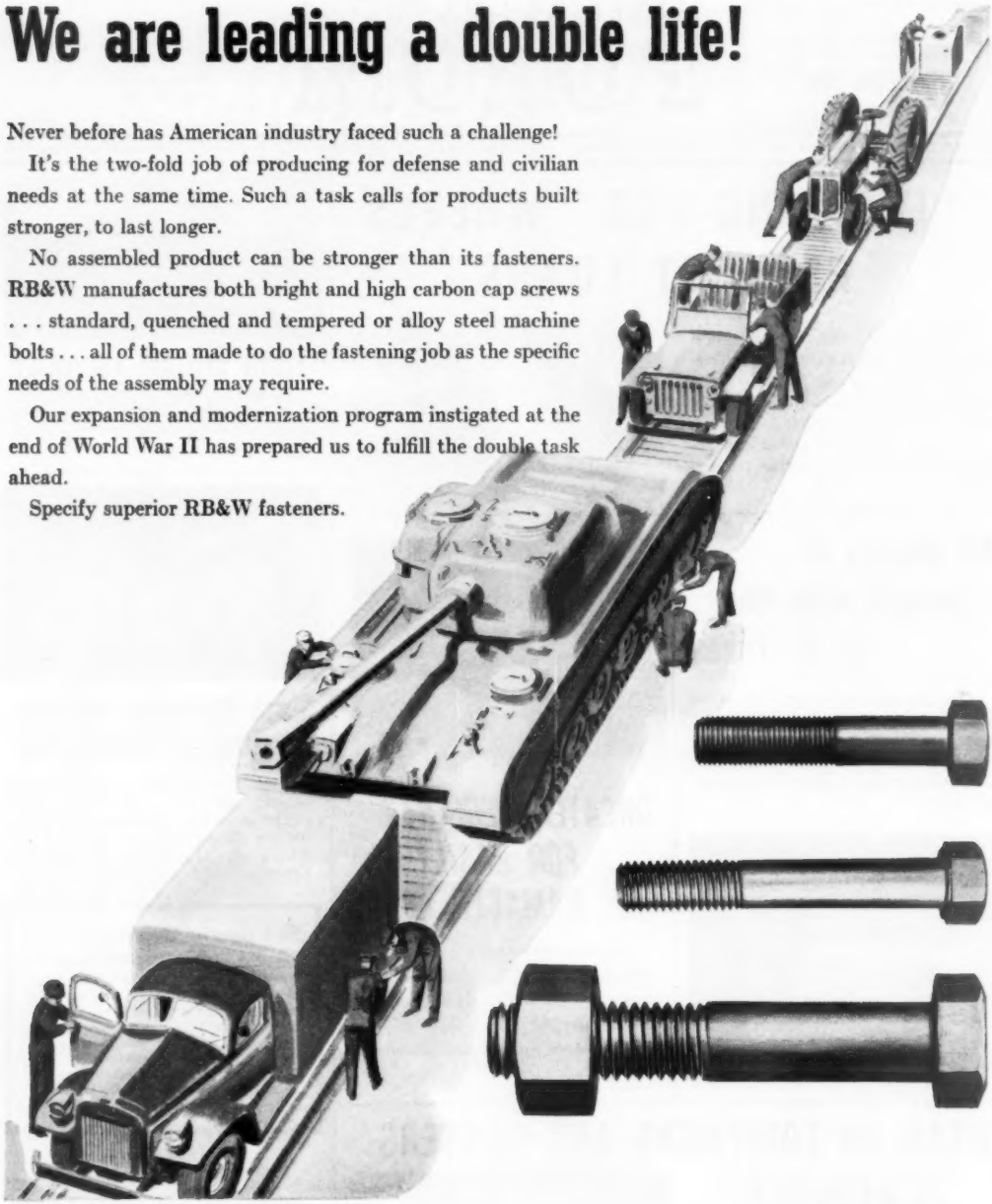
Never before has American industry faced such a challenge!

It's the two-fold job of producing for defense and civilian needs at the same time. Such a task calls for products built stronger, to last longer.

No assembled product can be stronger than its fasteners. RB&W manufactures both bright and high carbon cap screws . . . standard, quenched and tempered or alloy steel machine bolts . . . all of them made to do the fastening job as the specific needs of the assembly may require.

Our expansion and modernization program instigated at the end of World War II has prepared us to fulfill the double task ahead.

Specify superior RB&W fasteners.



RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

RB&W
THE COMPLETE QUALITY LINE

Plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices at: Philadelphia, Detroit, Chicago, Dallas, Oakland. Sales agents at: Portland, Seattle.

106 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

an ACCO product

Army Type WRIGHT SAFEWAY

• A steel hand hoist with compact, adjustable suspension and trolley to fit various width I-beams. Designed for low overhead. Easily converted to 2-wheel geared trolley unit.

Longer-life features include: steel in all load-supporting parts, load sheaves with five formed pockets, automatic load chain lubricator, alloy steel load chain, swiveling drop-forged load hook; alloy steel, machine-cut gears; fully enclosed, self-oiling gear case.

See your WRIGHT distributor or write for Bulletin **DH-269.**

2-wheel GEARED TROLLEY ASSEMBLY

ACCO

York, Pa., Chicago, Denver, Detroit, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

WRIGHT HOIST DIVISION
AMERICAN CHAIN & CABLE

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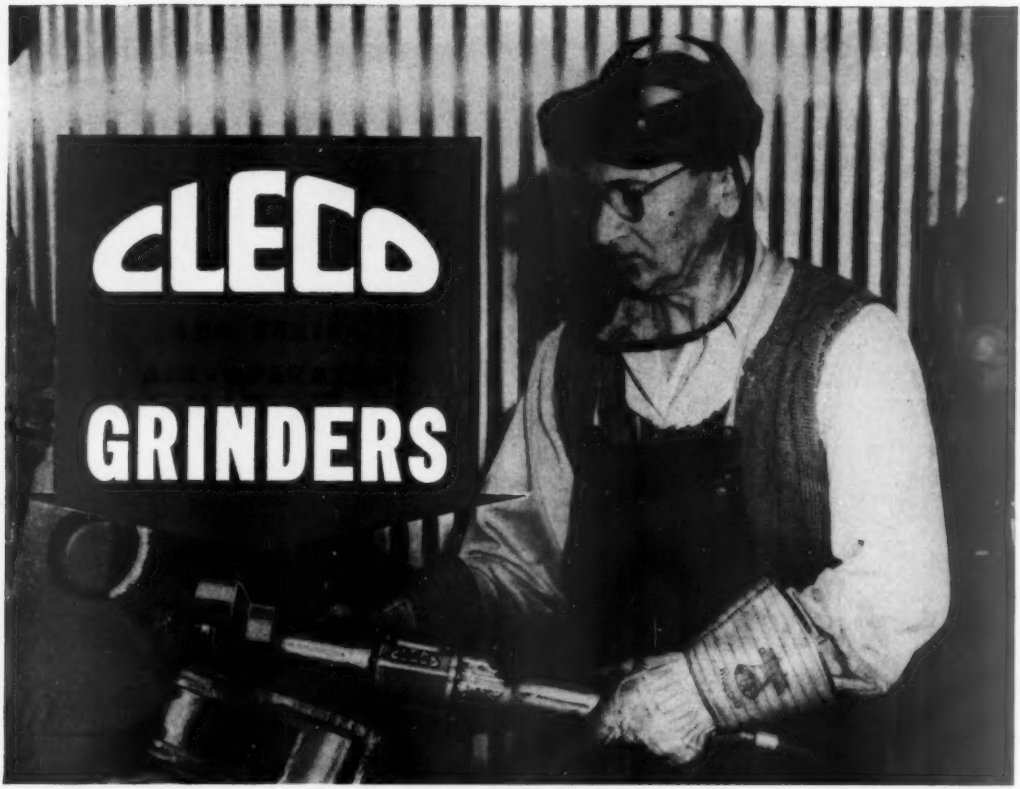
Hoists
Trolleys
Cranes



Fast grinder for Mn.-Mo. steel castings

Cleco 490 Series Grinders do a fast, economical job of cleaning up hard castings like these of manganese-molybdenum alloy steel. They cut fast—reducing cleanup time—and they stay on the job with a minimum of maintenance.

Don't waste time and money trying to use the wrong grinder when you can cut costs and increase output just by selecting the right tool.

Go over your grinding problems with a Cleco Field Engineer. Let him help you select the right grinder for each application. Ask him to suggest ways to get the most out of each tool. You will be surprised at the savings you can make.

CLECO AIR TOOLS

DALLETT

CLECO DIVISION

of the REED ROLLER BIT COMPANY, 5125 Clinton Drive, Houston 20, Texas, U.S.A.

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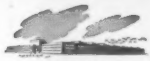
DISTRIBUTORS IN PRINCIPAL CITIES OF THE UNITED STATES AND THOUGHOUT THE WORLD

3332

Amazing "Friction Fighter"

extends bearing life as much as 17½ times... stops oil drippage! Saved $1275 on one machine!

ALEMITE *Automatic* OIL-MIST



Now from Alemite—world leader in lubrication—comes this great friction fighting achievement. Alemite Oil-Mist! The most efficient, continuous, fully automatic system in the field of machinery lubrication.

Alemite Oil-Mist! The system that atomizes oil into *mist*—distributes it through tubing to bearings—bathes *all* bearing surfaces with fresh, clean, cool oil film. A system that simplifies and materially cuts the cost of machinery lubrication. And the lubricator unit has no moving parts.

Oil-Mist uniformly maintains oil film on plain and anti-friction bearings, gears and chains *regardless of variations in load, temperature or speed.* Eliminates the "human element."

Here! Direct from a field report is the latest proof of Oil-Mist results!

Before Oil-Mist: 100 hours was the average life of spindle bearings on the precision grinder of a leading manufacturer. Cost of each replacement—$85 for the bearing and labor. *Plus* downtime.

After Oil-Mist: The same grinder has run 1,638 hours without a bearing replacement! Total saving to date: $1,275 (after deducting both the cost of the Oil-Mist unit and installation). **Name on request*

ALEMITE OIL-MIST Lubricates All Types of Mechanisms

Alemite OIL-MIST Lubrication

A PRODUCT OF SW STEWART-WARNER

Check All These OIL-MIST Advantages!

- **Reduces bearing temperatures as much as 20%.**
- **Continuous, uniform lubrication of all bearings.**
- **Air pressure seals bearings against dirt.**
- **Reduces oil consumption—up to 90%.**
- **Prevents product spoilage.**
- **Eliminates guesswork—each bearing picks up as much Oil-Mist as it needs.**
- **Reduces starting and running torque.**

Get the Facts NOW!

Alemite, Division of Stewart-Warner, Dept. G-42
1850 Diversey Parkway, Chicago 14, Illinois

☐ Please send me a FREE copy of your new and complete Oil-Mist Catalog.

☐ Please have your Alemite Lubrication Representative arrange a desk-top demonstration of Oil-Mist. This entails no cost or obligation on my part.

My name .....

Title .....

Company .....

Street .....

City ..... State .....

Most popular 1952 models!

This year, three out of four cars on U.S. roads will be old models!

39% will be three to nine years old—their major repair age. No wonder motor experts say this is the year of repair!

To thousands of auto service dealers, hundreds of miles from factories and parts depots, this great demand for repair parts will pose a problem.

That's why, in sales meetings with dealers, motor car companies advise: "For faster turnover, lower inventory, more good-will; order repair parts via . . . Air Express!"

Air Express speed cuts days from repair time, builds dollar business at a cost of pennies. Whatever your need, you can profit from regular use of Air Express. Here's why:

IT'S FASTEST—Air Express gets *top priority* of all commercial shipping services—gives the fastest, most complete door-to-door pickup and delivery service in all cities and principal towns at *no extra cost.*

IT'S DEPENDABLE—Air Express provides one-carrier responsibility all the way and gets a *receipt upon delivery.*

IT'S PROFITABLE—Air Express service costs less than you think, gives you many profit-making opportunities.

New parcel post regulations affect you? Call your local agent of Air Express Division, Railway Express Agency.

AIR EXPRESS

GETS THERE FIRST

A PROVEN SOURCE OF SUPPLY

LYON

FOR SHEET METAL CONTRACTS

• Lyon handled 3800 sheet metal contracts during World War II . . . a wide range of special parts and assemblies for aircraft, ships, tanks, ordnance.

Today, with two strategically located plants providing more than 600,000 square feet of production space, we are geared to do an even better job.

For sheet metal defense production and special contract work—Lyon is a *proven* source of supply.

MAIL COUPON FOR YOUR COPY

of this very comprehensive 20-page brochure. It gives the complete story of Lyon's facilities. Or contact your nearest LYON Field Representative.

LYON

METAL PRODUCTS, INC.

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2 STRATEGIC PLANT LOCATIONS

AURORA, ILL. • YORK, PA.

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412 Monroe Ave., Aurora, Illinois

Please send me a copy of "Craftsmen in Sheet Metal."

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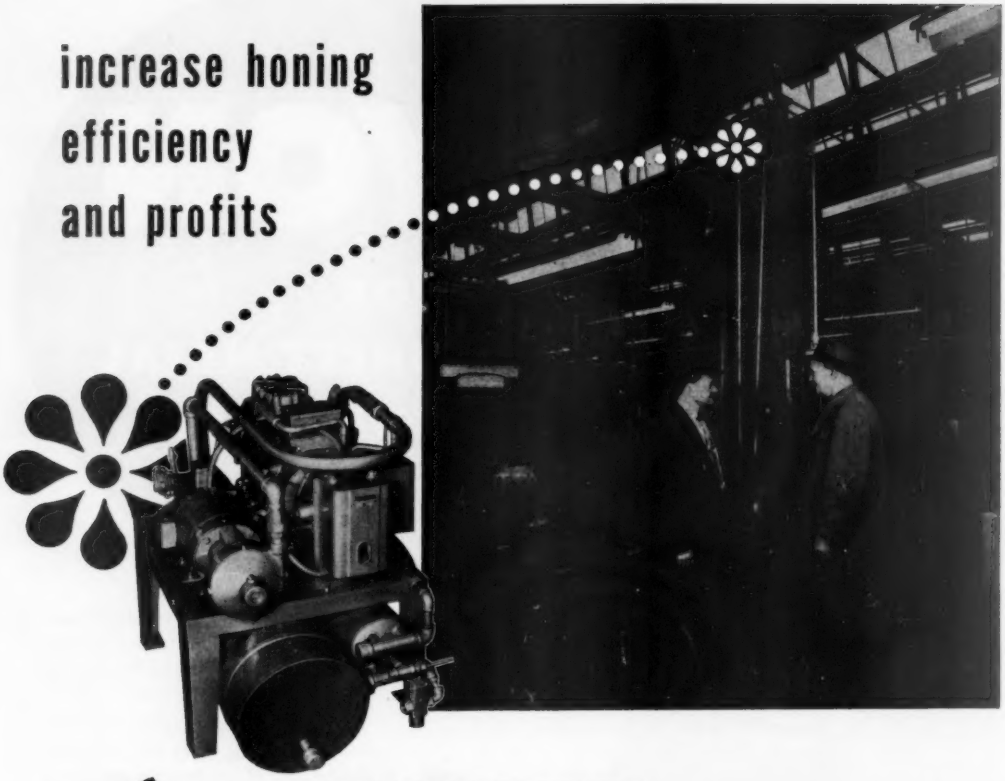
LYON PRODUCTS STILL SERVING INDUSTRY • BUSINESS • INSTITUTIONS • HOMES

• Shelving	• Kitchen Cabinets	• Conveyors	• Economy Locker Racks	• Display Equipment	• Filing Cabinets	• Service Carts	• Tool Stands
• Lockers	• Cabinet Benches	• Bar Racks	• New Freedom Kitchens	• Flat Drawer Files	• Folding Chairs	• Sorting Files	• Shop Boxes
• Stools	• Storage Cabinets	• Tool Boxes	• Toolroom Equipment	• Revolving Bins	• Work Benches	• Drawer Units	• Tool Trays
• Bin Units	• Drawing Tables	• Parts Cases	• Wood Working Benches	• Hanging Cabinets	• Bench Drawers	• Hopper Bins	• Shop Desks

increase honing efficiency and profits



with Acme FLOW COLD® Packaged Liquid Chiller

PROBLEM

THE REO MOTOR COMPANY in Lansing, Michigan had two honing machines that were not operating at peak efficiency because the oil used in the coolant process picked up large amounts of heat during the honing operation. The result was low production and a large number of rejects. Extremely limited space made the installation of the usual industrial chilling unit impossible.

PLAN

Acme engineers recommended the installation of a 15-horsepower Flow-Cold Liquid Chiller. This unit with a cooling capacity of 40 gallons per minute in reducing the coolant used from 90 to 70 degrees, met minimum space requirements. Mounting the pump of the chiller on the floor and the liquid chiller overhead allowed the pumps of the honing machine to remain in the same position where they could continue to service the machine when the chilling unit was shut down.

PROFITS

An immediate increase in production capacity and a decrease in the number of rejects was evidenced as the heat was dissipated during the chilling process and the coolant returned to the honing machines at a constant temperature. The compact packaged Flow-Cold serviced the two honing machines with maximum efficiency and performance.

Since this installation was made Reo has added two more Flow-Cold "packaged" units — one for a broaching machine and the other for a quench-bath cooling process.

ACME PRODUCTS

ACME INDUSTRIES, INC., JACKSON, MICHIGAN, U.S.A.

Flow Cold Division

CONTINUOUSLY SERVING THE AIR CONDITIONING AND REFRIGERATION INDUSTRIES SINCE 1919

FROM THE *Udylite* RESEARCH LABORATORIES

... UDYLITE #53

Here, brought to you by Udylite, is the best, fastest bright cadmium process ever to be devised—Udylite #53. It's TOPS in Brightness, TOPS in Throwing Power, TOPS in Plating Speed and TOPS in Covering.

Udylite Bright Cadmium Process #53 gives you outstanding brilliance with excellent speed and exceptional throwing power PLUS added operating economy. This bath is highly resistant to both organic and metallic impurities. Udylite #53 provides high cathode efficiency and operates over a wide current density range with very little "gassing" and no spray. Drag-out is extremely low, thereby reducing wastage.

With Udylite #53, complicated parts with deep recesses or of intricate shape can be plated uniformly because of the inherent stability of the brightener. And here's the best part of all: Only one liquid brightener is required for the process, making it a very easy and simple operation. Have your Udylite Technical Man tell you the entire story of Udylite #53, or write direct today.

THE *Udylite* CORPORATION
DETROIT 11, MICHIGAN

"What clue to quality can they offer you?"

PERFECTLY MATED! Only Phillips Drivers are perfectly mated to Phillips Screws. Look for the name Phillips on the shank.

AMERICAN SCREW COMPANY • ATLANTIC SCREW WORKS, INC.
THE BLAKE & JOHNSON CO. • CAMCAR SCREW & MFG. CORP. • CENTRAL SCREW CO.
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STRONGHOLD SCREW PRODUCTS, INC. • WALES-BEECH CORP.

ANSWER: Phillips Cross-Recessed-Head Screws—a clue that more than 15 million readers of The SATURDAY EVENING POST are being told to look for. When you assemble your product with these famous fasteners, you give it an *extra* mark of quality that registers on sight! Remember, too, you save time, work, and money when you use Phillips Wood, Machine, Tapping Screws or "Sems". They start faster, do away with driver skids, damaged parts, split screw heads. They set up tighter, resist vibration . . . and add structural strength. Include Phillips Screws in your specifications.

X *marks the spot . . . the mark of extra quality*

PHILLIPS *Cross-Recessed-Head* **SCREWS**

As Advertised in The Saturday Evening POST

THE FASTENERS OF TODAY . . . AND OF THE FUTURE

cut filtering costs up to 75%

with New Automatic Self-Cleaning COOLANT FILTER

For individual machines or small central systems

Two Types Available

(a) **Houdaille WEB-O-MATIC with built-in ramp for applications requiring above-floor installation.**

(b) **Houdaille WEB-O-MATIC for applications requiring discharge of chips and contamination below floor level.**

Eliminates frequent, costly filter changes...takes up less floor space

New WEB-O-MATIC Coolant Filter employs rotating filter belt that cleans itself . . . reduces filter operating and maintenance expense up to 75%! Continuous, automatic operation requires virtually no attention, effectively removes chips, abrasive particles, harmful solids. Handles large volume of coolant in minimum floor space; 50 GPM model (for soluble oil coolant) is only 43" x 53½".

Mesh and speed of belt may be varied to suit volume, viscosity and contamination of coolants. WEB-O-MATIC is ideal for all types of grinders, broaches, drilling, lapping, milling machines, etc., wherever a mineral or soluble oil coolant is used. Capacities 50 to 400 GPM of soluble oil coolant.

Write for WEB-O-MATIC Bulletin with complete information, specifications, etc.

WORLD LEADING OIL FILTER MANUFACTURER

Honan-Crane Corp. 325 Superior Avenue, Lebanon, Indiana

A Subsidiary of **Houdaille-Hershey Corporation**

In Canada: E. W. PLAYFORD, LTD., Montreal 28
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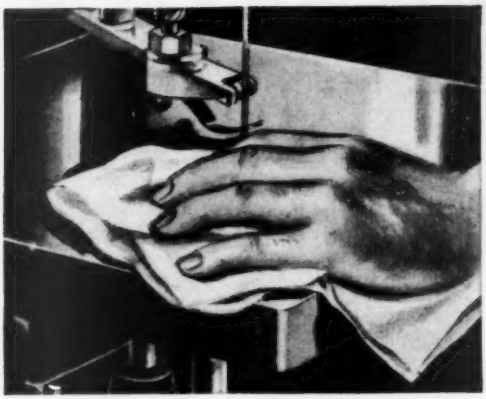
CUMMINGS GALBRAITH, LTD., Edmonton, Alta.

For wiping and polishing



Kimwipes*...

new industrial tissues

At last! A new, efficient cleaning material for a myriad of special wiping uses. Soft, fresh KIMWIPES* industrial wiping tissues. Easy and pleasant to handle—use a fresh, clean tissue for each application, and throw away. Recommended for use on all highly finished surfaces. Highly absorbent—picks up and holds all kinds of liquids.

Useful in machine shops, packing rooms—almost any type of business, for any type of job.

Automatic serve-up packages

The Bureau of Federal Supply stocks Kimwipes size 15" x 18" in all Supply Centers under stock item #53P23121-800.

Kimwipes

INDUSTRIAL WIPING TISSUES

A product of Kimberly Clark

*T. M. REG. U. S. PAT. OFF.

KIMBERLY-CLARK CORPORATION FMM-452
Neenah, Wisconsin
Please send me Kimwipes literature.

Name _____

Firm Name _____

Address _____

City _____ *Zone* _____ *State* _____

a lot of YOUR overhead . . .

IS underfoot!

Dirty office and plant floors affect your profits a lot more than you may think. You can cut cleaning costs sharply with a

TORNADO®

INDUSTRIAL VACUUM CLEANER

The high-power, TORNADO Model 92, four-in-one vacuum cleaner pulls air at velocities up to 300 M.P.H. and more! It actually picks up water, grease, machine oil, scrubbing compound, scraps, metal chips, dust and debris . . . all in one stroke over the surface being cleaned.

Versatile attachments clean walls, acoustical ceilings, overhead fixtures and shop equipment, and removable motor-blower unit becomes a shoulder-type vacuum or portable, high-velocity blower.

Engineered by cleaning specialists, TORNADO cleaning units like the Model 92 mean faster, more thorough cleaning and saving on maintenance. They pay their own way many times over. Find out about the advantages and savings you get with TORNADO industrial vacuum cleaners and cleaning equipment. Write for bulletin 600 today.

BREUER ELECTRIC MFG. CO

5084 N. RAVENSWOOD AVE. • CHICAGO 40, ILL.

Lincoln BULLNECK* FITTINGS

Ball-In-The-Head Keeps Dirt Out... Grease In

The Only Complete Line of Grease Fittings with the BALL-IN-THE-HEAD

Seals Dirt Out ....Grease In!

CLOG WITH DIRT AND GRIT

THROAT OF ORDINARY

Look at these Construction Features Found Only in Lincoln Bullneck Fittings... at NO EXTRA COST!

Bullneck* Fittings are Available in the Complete Range of Types and Thread Sizes

Write for Additional Information and Catalog, or Contact Your Nearby Lincoln Sales Office...

1. **Flush Ball Check** — head can be wiped clean without forcing dirt into fitting and into bearing.
2. **Large Grease Passage** — The larger internal diameter permits greater flow of lubricant.
3. **Special Spring Design** — Spring cannot be compressed to restrict flow of the heaviest lubricants.
4. **Sturdier Construction** — Enlarged neck size and projecting locking pad protect against damage and wear.

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••• PIONEER BUILDERS

LINCOLN LUBRICATING EQUIPMENT

*Tradename Registered

••• LINCOLN ENGINEERING CO., 5731 Natural Bridge Ave., St. Louis 20, Mo.

Thor

ANNOUNCES A NEW

AIR IMPACT WRENCH

With Exclusive Rolling Ball Type Cam!

Spectacular results in field tests conducted during the past year have fulfilled all performance promises of Thor's "rolling ball"—an exclusive new cam design incorporated in Thor 3/8" Air Impact Wrenches now being delivered to the trade.

The new cam design permits drawing threaded fasteners down faster and tighter BEFORE IMPACTING—the operation is speeded and fewer impact blows are required for final tightening.

Coupled with a large overload capacity, the new type wrenches are only moderately stressed in performing work within their rated capacity, resulting in greatly increased normal working life.

Basically designed to produce the ultimate in tightness in all threaded fasteners such as nuts, bolts, lag screws, etc., these tools can also be used for tapping, for drilling in concrete, metal or wood, and for producing large diameter holes with hole saws or similar type cutters.

ILLUSTRATED ABOVE—Thor "No. 24" Air Impact Wrench, 3/8" Bolt Size Capacity. New Machine weighs 5¾ lbs., is 8-11/16" long overall.

For Details or Demonstration Write

INDEPENDENT PNEUMATIC TOOL COMPANY

AURORA, ILLINOIS

Branches in 20 Principal Cities

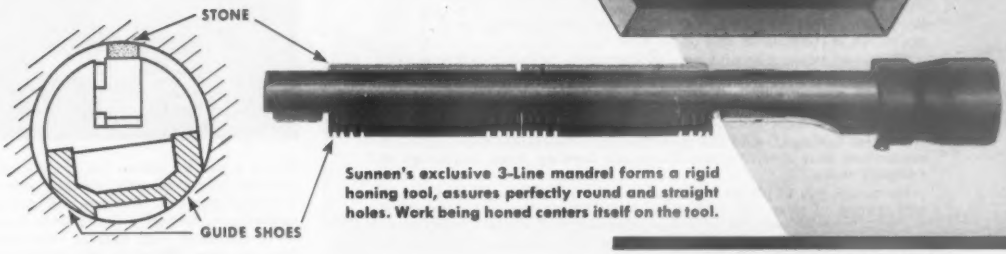
Thor TOOLS

ELECTRIC • PNEUMATIC

SIZE and FINISH I.D.'s WITH EXCEPTIONAL ACCURACY and SPEED, With Sunnen's Exclusive 3-Line Honing Tools

SUNNEN® HONING MACHINES

"Accuracy at Low Cost"



Sunnen's exclusive 3-Line mandrel forms a rigid honing tool, assures perfectly round and straight holes. Work being honed centers itself on the tool.

HOLD CLOSE TOLERANCES... WITH
Production Rates 4 to 10 Times Faster Than Lapping

Sunnen Honing Machines hone straight, round holes ... geometrically perfect ... free from bell-mouth, taper, and rough spots. They hone metals, ceramics, glass — are used for everything from de-burring to micro-fitting. Dimensional accuracy is guaranteed to .0001" — in some instances is held to 25 millionths. Surface finish to 2 micro-inches can be produced in hardened steel. Diameter range is 1/8" to 2 5/8".

Many prominent manufacturers regard their Sunnen Honing Machines as indispensable for production, tool room, salvage and maintenance operations — any place where accurate hole tolerances must be held.

A complete Sunnen Honing installation costs about $1,000.00. Send the coupon for free descriptive machine bulletin.

Pump engine tappet with tandem holes

Material — 1020 carburized steel
Hardness — Rockwell 60-63 "G"
Hole Diameter — .625"
Length — 7/16" (each hole)
Tolerance — .00025"
Finish — 10 micro-inches
Stock Removal — .0005" to .001"
Production — 60 per hour

SUNNEN PRODUCTS COMPANY
7955 Manchester Ave. • St. Louis 17, Missouri
Canadian Factory: Chatham, Ontario

661

Let SUNNEN HONING Solve Your Hole Problems

SUNNEN PRODUCTS COMPANY
7955 Manchester Ave., St. Louis 17, Mo.

☐ Please send me information on Sunnen Honing.
☐ See enclosed data. Send recommendations.
☐ Please have representative call.

Name.....

Company.....

Address.....

City..... State.....

If you think you've cleaned out all your dormant scrap

PLEASE LOOK AGAIN

MAYBE you're like the prominent manufacturer who, when first approached by the Committee on Iron and Steel Scrap, stated: "We have well organized Salvage Departments in all our plants who accumulate and dispose of retired equipment as scrap so that the operation is continuous and up to date."

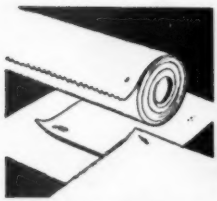
However, when a second appeal was made, pointing out how desperately scrap was needed, and requesting that he make a further, thorough search to see if additional dormant scrap could not be uncovered, here's what happened: *1,469.6 tons of scrap iron and steel were brought to light and sold.*

"These findings," said the manufacturer, "certainly bear out your contention that special scrap drives can turn up large quantities of valuable scrap."

So we ask *you* to please look again . . . to comb through every nook and cranny of your plants to make sure that you've not overlooked a single piece of old and useless equipment that could be scrapped.

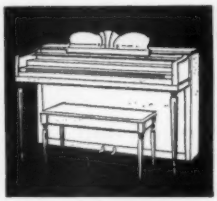
This job of getting out every last pound of industry's dormant scrap is primarily one for top managment—for you men, who alone have the authority to say "Scrap that Stuff." Without your personal and wholehearted cooperation, enough scrap will not be turned in. Without this scrap, the steel that industry must have to keep the wheels turning will not be turned out. That's why it's so important that you look again, and look *hard.*

Let us add your name to this SCRAP DRIVE HONOR ROLL



THE NORTHWEST PAPER CO. manufacturers of "Pedigreed Papers," write from Cloquet, Minn., "We will be glad to do all we can to get ferrous scrap out of its resting places and into the steel mills. We have gone at it more intensively than ever this year and during the first five months have shipped out 354 tons of scrap, a 125% increase over the same period last year. We will continue our intensive efforts along this line."†

JOHNSON & JOHNSON famous name in the field of surgical dressings and hospital supplies report progress in their campaign to salvage iron and steel scrap; "In our New Brunswick Plant alone, where this campaign is already in progress, we recovered and sold a total of 28 tons of scrap during the months of June and July. Further substantial quantities will be salvaged here in New Brunswick, as well as in our other mills, during coming months."†



AEOLIAN AMERICAN CORPORATION maker of fine pianos, writes: "The piano industry has appointed its own special committee on scrap salvage and we have already inaugurated a very intensive program for salvaging iron and steel scrap. As a result of our salvage activities we have disposed of almost 23 tons of scrap, so that you can see that we have made a pretty thorough campaign on this."†

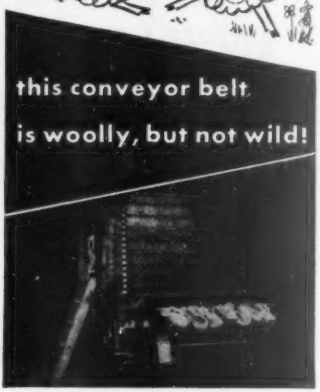
†*These Scrap Drive reports are excerpted from letters to the American Iron and Steel Institute, Committee on Iron and Steel Scrap.*

USS

You'll find your local scrap dealers listed in the yellow pages of the telephone directory

2-449

UNITED STATES STEEL



That's a true turnabout for this example of a specially designed Cambridge woven wire conveyor belt. This one carries wet, washed wool through a drying oven to remove moisture and washing chemicals from the fibre. There's no wild belt travel because the Cambridge Chain Drive design used here prevents the belt from riding from side to side across the pulleys . . . maintains straight belt movement.

Open mesh of the wire belt permits free, even heat circulation. All-metal construction gives longer belt life and lower maintenance costs.

Cambridge Chain Drive Attachment

Whether you're processing textile fibres, foods, chemicals, metal or ceramic products, a Cambridge woven wire conveyor belt can help you cut production costs and maintain product uniformity by combining movement with processing. But don't have the wool pulled over your eyes on conveyor belt design . . . be sure to call in your Cambridge field engineer for his recommendation on the proper—

CAMBRIDGE WOVEN WIRE CONVEYOR BELT —any metal or alloy, mesh or weave.

Write direct or look under "Belting-Mechanical" in your classified telephone directory.

FREE BELT MANUAL contains information on conveyor and belt design and specifications, metallurgical data and belt maintenance. Write for your copy today.

The Cambridge Wire Cloth Co.

Dept. E · Cambridge 4, Md.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

Give Two Ejection Problems the Air

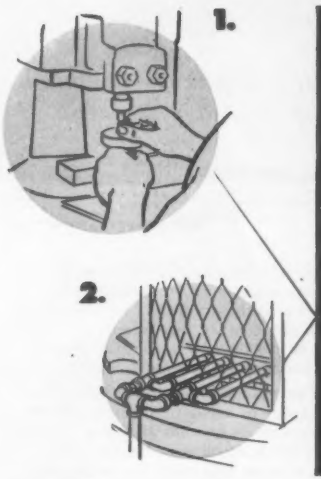
...and boost production and safety

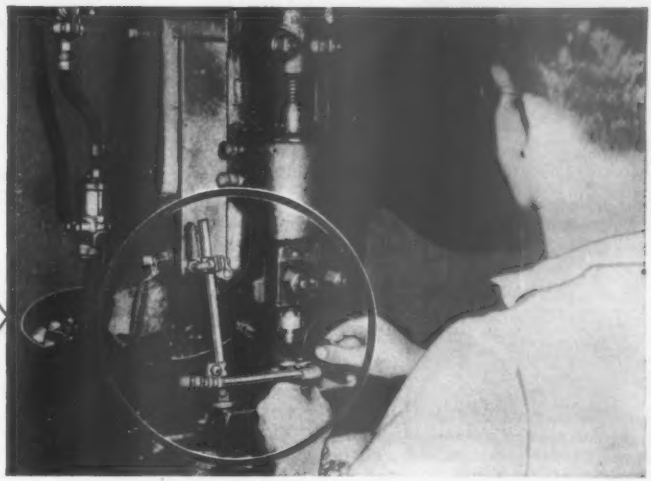
1 End slow, dangerous hand removal of work with a Schrader Air Ejection Set. Install Schrader Air Ejection Sets on your power presses—or any machines with moving parts to actuate a cam or sliding tripper. You'll find production soars—up to 100% ... operator safety is boosted 50%. Replace hand removal with Schrader Air Ejection and watch your presses take a new lease on life.

2 Replace wasteful, homemade steady air blasts with Schrader Air Ejection Sets. Air costs drop as much as 90% because Schrader Air Ejection Sets ration out *just enough* air to do the job ... synchronize your air blast with demand. Before you decide your old compressors have reached full capacity, check with Schrader to see how to cut air waste.

Schrader Air Ejection Sets are delivered fully assembled and ready to go to work. Their low cost is more than repaid in just a few weeks.

See how Schrader Air Ejection Sets will help you plan more effective use of machines. Write, describing the machines on which their use is contemplated—or fill out the coupon below.





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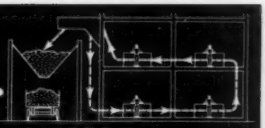

ALL AROUND YOUR PLANT— *Hapman* TUBULAR CONVEYORS

can carry flowable materials at tremendous savings!

IF YOU HANDLE flowable materials similar to *any* of these **PRODUCTS:**

Bulk Chemicals: (Wet dry, abrasive, corrosive, radioactive)

Food: Starch, flour, malt, grain, coffee or

BY-PRODUCTS:

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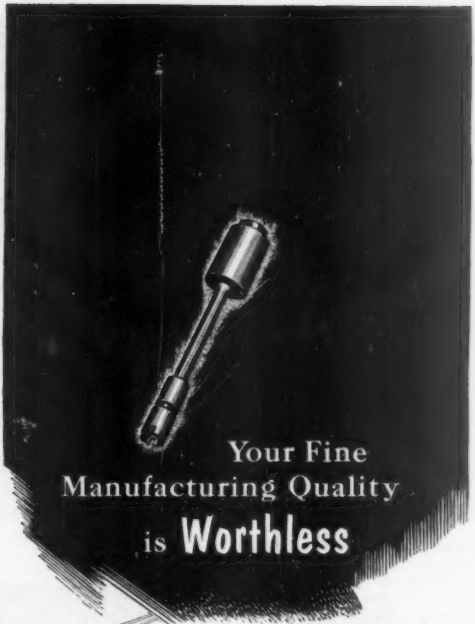
Coal or clay, etc.

YOU MAY REAP ENORMOUS SAVINGS— some of America's most cost-conscious firms are doing it — with plant-wide systems of Hapman Tubular Conveyors. The list of materials you can handle is almost endless. You gain great advantages, both mechanically and in terms of labor saved. The stakes are high — why not investigate now? Write today for Bulletin FM-452.

Hapman CONVEYORS, INC.
DIVISION HAPMAN-DUTTON COMPANY
KALAMAZOO MICHIGAN



Your Fine Manufacturing Quality is **Worthless**

... If Products are Damaged in Transit or Storage

No matter how fine your finished products may be, they are always subject to serious damage in transit and storage if not properly packaged for full protection against abrasion, dirt, moisture, dust, water . . . under extremes of heat or cold. Such damage often makes those quality products worthless to the buyer, and *you are blamed.*

No matter what your products may be . . . tiny or tremendous, hard goods or soft . . . Kennedy's expert packaging engineers are always ready to develop, and its extensive plant is fully equipped to produce the necessary bags and covers of paper, foil, plastic film or combinations of each that will assure this vital protection. Such packaging means product delivery in factory-fresh condition, regardless of time or weather.

Domestic and Military

Armed with all-out experience in two world wars, Kennedy is fully prepared to meet in stride both domestic and military packaging demands of today . . . and tomorrow. Write or wire for assistance of our packaging engineers. No obligation.

DIMENSIONAL PACKAGING
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SHELBYVILLE, INDIANA
NEW YORK PHILADELPHIA BUFFALO CLEVELAND DETROIT
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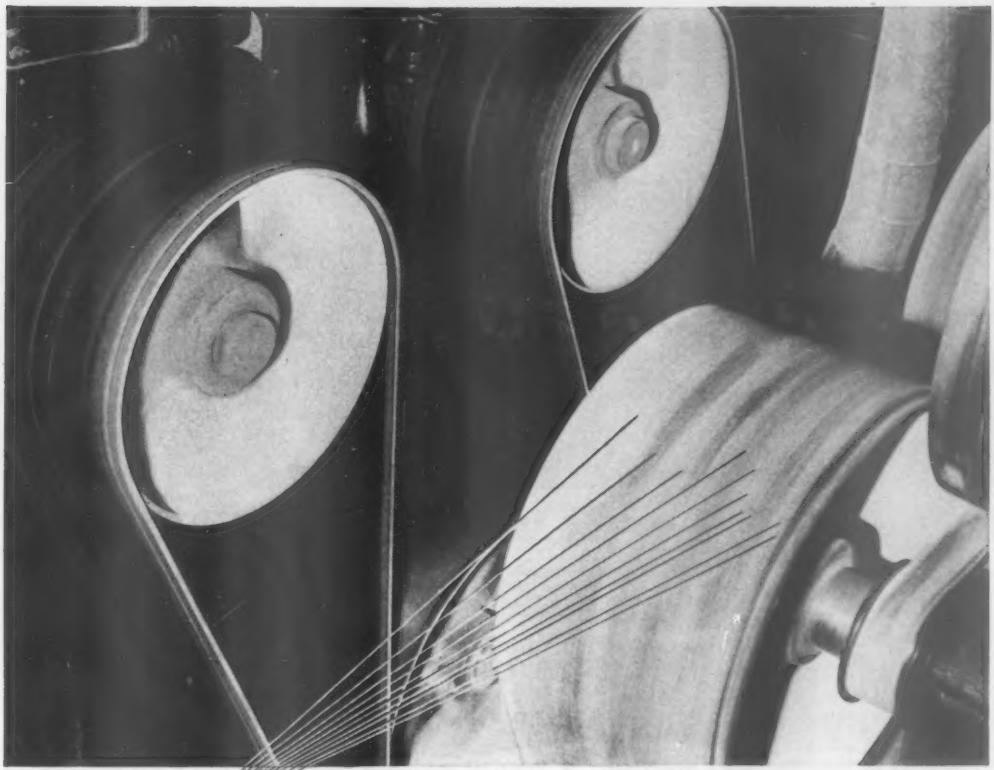

SINEWED for extra STRETCH-FREE STRENGTH with DU PONT "CORDURA"!

Stretch and slippage are virtually eliminated in leather belting reinforced with this Du Pont High Tenacity Rayon yarn.

Thin cords of "Cordura" placed between laminations of leather in a belt add stretch-free strength to leather's natural hold. Yarns of "Cordura" are much stronger than yarns of natural fibers, because "Cordura" is made in continuous filaments. There are no short ends to pull apart under stress. Belts require fewer take-ups, less maintenance.

You'll find "Cordura" in a wide variety of products today . . . the unseen component that makes truck tires stronger and safer at high speeds, hoses lighter yet tougher, conveyor belts more flexible, with better troughability.

Send the coupon now for the free booklet "Sinews for Industry." It tells how "Cordura" improves products you use, and may also suggest improvements in products you make.

"Cordura"

STRENGTH AT LOW COST

HIGH TENACITY RAYON

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Textile Fibers Department
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Room 4421F-2, Wilmington 98, Del.
Please send me the free booklet "Sinews for Industry."

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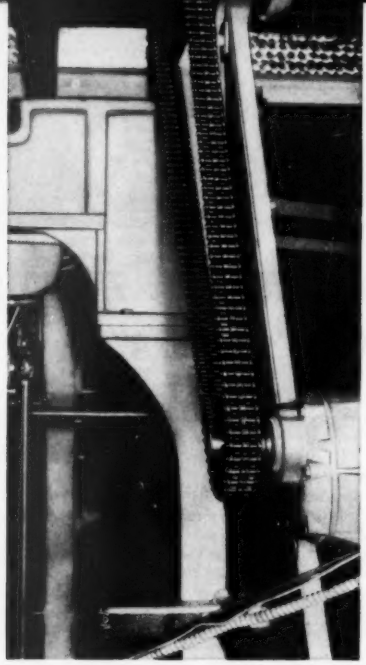
SIMPLIFIED DRIVING »
of a Series of Rollers

By means of Diamond Roller Chains, series of rollers are driven at different (selected) speeds, in a simple, reliable manner. Double 433 and single 424 Chains used.



On the Clermont Sheet Former Matzo Machine, the power transfer medium is Diamond double 433 Chain.

Engineered With DIAMOND ROLLER CHAINS

• Practical machinery design engineers make wide use of DIAMOND Roller Chains to accomplish results not easily done otherwise. As an example, note the driving of several stages of rollers on the Clermont Machine Co. Matzo Dough Roller.

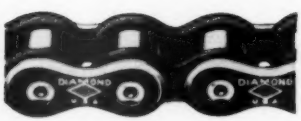
By use of Diamond Chains, the engineers simplified the design, kept weight to a minimum, and provided the exact, though different speed ratios for the several stages, and insured long-life, trouble-free operation.

For peace-time competition and defense preparedness production, you can rely on the dependability of power transfer that *Diamond* Roller Chains provide.

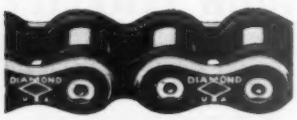
DIAMOND CHAIN COMPANY, Inc.
Dept. 449 402 Kentucky Avenue, Indianapolis 7, Indiana

Offices and Distributors in All Principal Cities

Refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER



DIAMOND ROLLER CHAINS



Chrysler Airtemp...

LIQUID COOLANT COOLERS AND PACKAGED AIR CONDITIONERS*

TAKE THE HEAT OFF HIGH SPEED PRODUCTION

Uncontrolled temperatures play havoc with high speed production schedules. Workers and machines are less efficient, both fail to give peak performance unless temperature levels are kept at a constant degree. Here's where Chrysler Airtemp can help. When you install Chrysler Airtemp temperature-control equipment in your plant, production will increase. Costly breakdowns and failures—of men and machines—will be averted. Chrysler Airtemp products are factory engineered and warranted to give effective temperature-control. Mail coupon today for full details on how Chrysler Airtemp can bring you the benefits of proper temperatures in your operations.

LIQUID COOLANT COOLER*

Handles all types of coolants from aqua solvents to heavy tapping and hydraulic oils. Installation permits one cooler to service one or several machines.

PACKAGED AIR CONDITIONERS*

Compact, easily installed. Six available sizes of 2, 3, 5, 11 and 15 ton. Units are factory-assembled and tested.

***COMPLETE FIVE-YEAR WARRANTY**

Compressor units in all "Packaged" Air Conditioners and Liquid Coolant Coolers carry an optional five-year warranty, through dealers. This warranty covers compressor replacement, freight to and from the factory, plus a labor allowance for removing and installing compressor assemblies.

Chrysler Airtemp

AIR CONDITIONING • HEATING • COMMERCIAL REFRIGERATION

Airtemp Division of Chrysler Corporation, Dayton 1, Ohio

CHRYSLER AIRTEMP — A VITAL FORCE IN NATIONAL DEFENSE

Airtemp Division, Chrysler Corporation FM-4-52
Dayton 1, Ohio

Please send me information showing how Chrysler Airtemp can help me boost production with "packaged" Air Conditioners and Liquid Coolant Coolers.

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LUFKIN "ANCHOR"

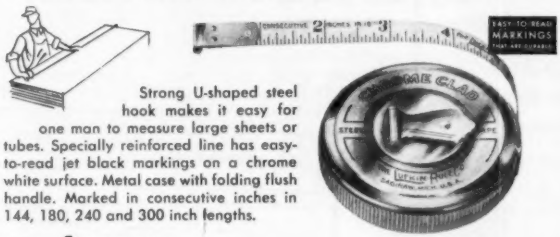
CHROME-CLAD TAPE

extra-durable, suitable for a wide variety of uses

Lufkin "Anchor" Chrome-Clad steel tapes are a favorite with workmen in many fields. Permanent jet black markings stand out sharp and clear against the chrome white background. Mahogany colored hand-stitched genuine leather covered case with plated trim. Rust resistant steel case liner. Winding handle folds flush, opens with push pin. Marked in feet, inches and 8ths; or feet, 10ths and 100ths ft.; in 25, 50, 75 and 100 foot lengths.

LUFKIN CHROME-CLAD MILLMENS TAPE

THE RIGHT TAPE FOR SHEET STEEL WORK



Strong U-shaped steel hook makes it easy for one man to measure large sheets or tubes. Specially reinforced line has easy-to-read jet black markings on a chrome white surface. Metal case with folding flush handle. Marked in consecutive inches in 144, 180, 240 and 300 inch lengths.

BUY LUFKIN

TAPES • RULES • PRECISION TOOLS FROM YOUR INDUSTRIAL DISTRIBUTOR
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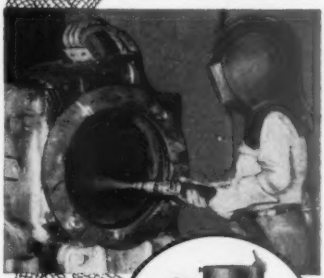
It's "CORNY"

...but it's the best way to CLEAN motors, generators, turbines!



- ***CUTS DOWN-TIME***
- ***CLEANS WITHOUT SOLVENTS***
- ***ELIMINATES DRYING***
- ***ELIMINATES TOXIC AND EXPLOSIVE DANGERS***

THE new Pangborn AC-4 Blast Machine cleans motors, generators and turbines faster . . . cleaner . . . and lets you use them sooner because there's no waiting for parts to dry. In fact, dangerous solvents that can lead to explosions, caustic action, and toxic poisoning are completely eliminated!

The AC-4 uses soft, 20-mesh corncob grits to rapidly remove dirt, grease, old paint, etc., in one-third the time, and at 90% less cost than old-fashioned methods. GET FULL DETAILS . . . write, telling us what you clean, to: PANGBORN CORP., 2100 Pangborn Boulevard, Hagerstown, Md.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

Pangborn

BLAST CLEANS CHEAPER
with the right equipment for every job

SPECIAL JOBS

SPECIAL HANDLING

Specially designed conveyer dock . . .

POWELL ENGINEERED PALLET CUTS HANDLING TIME FOR CHEMICAL FIRM

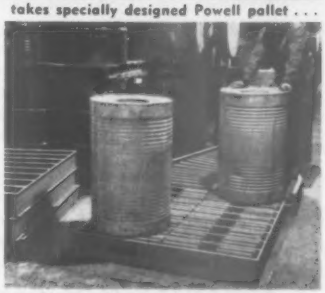
An unusual handling problem was solved at the Pittsburgh Industrial Chemical Co., Clairton, Pa., by a combination special roller conveyer and special pallet.

The Pittsburgh Industrial Chemical Co. is a large producer of resinous materials which are poured in hot liquid form into very light gauge, fifty-gallon drums. These drums are then taken to a cooling yard where the resins set and become hard. After hardening handling is a simple matter, but handling the hot liquid resins in the thin containers was the problem that was solved by company engineers working with the Powell Pressed Steel Co., producers of special all-steel handling equipment.

A special design of pallet that would mesh between the rollers of the conveyer was originated by Powell. The pallet is placed into the conveyer in a manner that allows the rollers to extend a fraction of an inch above the pallet. Thus the fragile drums of hot liquid are easily pushed right over the pallet, and a standard fork truck then lifts the pallet away from the conveyer, the load already seated on the pallet with a minimum of handling.

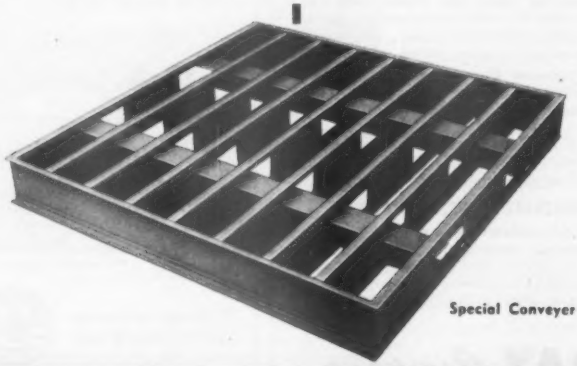
Prior to the pallet method of handling the drums were hand pushed along long sections of conveyer to a cooling room where each drum required individual handling. The pallet system enabled handling of the drums in multiples of four — eliminated the long cooling conveyers, opening up added floor space — and allowed stacking which further conserved valuable floor space. In addition this system has not only greatly reduced handling time, but has enabled faster production with the same handling crew. And, because the product is handled with such ease it eliminates the need for a more substantial and more costly drum.

takes specially designed Powell pallet . . .



making loading fragile drums easier . . .

and lift truck handling more efficient.



Special Conveyer Pallet

POWELL PRESSED STEEL
Since 1920

Coated Abrasives Division

NOW SERVED BY DAY DUST CONTROL

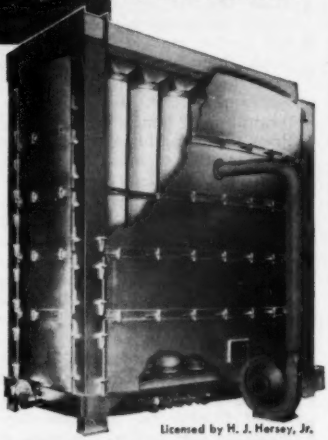
FIFTIETH ANNIVERSARY · 3M COMPANY · 1902 ★ 1952

3M Office Building

"Meets our rigid requirements . . . Keeps our plant clean . . . Keeps our maintenance costs low."

These are typical statements coming from the Coated Abrasives Division of Minnesota Mining and Manufacturing Co., St. Paul, since the installation of DAY Type "AC" Dust Filters.

Used for the recovery of abrasive materials, the DAY Filters are reclaiming abrasive dusts with better than a 99.998% efficiency. This high filtering efficiency is possible because the principle of operation in a DAY Filter permits the use of a high grade filtering felt. In addition, the other rigid dust control requirements of the 3M Company are being met.



Licensed by H. J. Hersey, Jr.

ADVANTAGES OF DAY TYPE "AC" DUST FILTERS

Continuous-Automatic Operation . . . reverse air jet rings move slowly up and down the filtering tubes, cleaning continuously.

Constant Air Volume . . . assured by back pressures leveling off after starting.

Higher Air-To-Cloth Ratio . . . 10, 15, or even 20 to 1 ratios with uniform back pressures.

Smaller Units, Less Floor Area Required . . . with no sectional shutdowns necessary for cloth cleaning, less filter is required for equal volumes of air.

Separated Dust Streams . . . several different product streams may be handled simultaneously without mixing.

EASY PLANT HOUSEKEEPING: The 3M Company also reports that these advantages make plant housekeeping easy and result in a clean plant—an aid to employee morale, high production and low plant maintenance costs.

71 YEARS' EXPERIENCE IN INDUSTRIAL DUST CONTROL

The DAY Company is proud to offer skilled engineering and service gained through 71 years' experience in the engineering, manufacture and installation of dust control systems for industry. If you have a dust problem, DAY can provide an effective and economical solution. DAY engineers are at your service for plant studies and cost estimates. CALL OR WRITE-TO-DAY FOR MORE INFORMATION.

DAY SINCE 1881

The DAY *Company*

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IN CANADA: P. O. Box 70R, Ft. William, Ont.
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If you have a **FACTORY PROBLEM** *in production, assembly, packaging, shipping*

You can save time and money with the proper use of

SEAMLESS F.O.S. INDUSTRIAL TAPE

For masking, holding, packaging, backing, hinging, protecting, reinforcing, identifying, splicing, sound-proofing, insulating, stenciling, bundling, sealing, binding

USE SEAMLESS **F.O.S.** *Industrial Tape*

Call or Wire

collect for authoritative advice and suggestions. Prices, catalogues, samples on request. Tape to meet govt. specifications. Wire details collect for 24-hour reply.

"Originators of Pressure-Sensitive Industrial Tape"

INDUSTRIAL TAPE DIVISION
THE SEAMLESS RUBBER COMPANY
NEW HAVEN 3, CONN., U. S. A.

ILG UNITS FOR EVERY VENTILATION NEED. Portable floor fans for spot cooling . . . circulators and window ventilators for offices . . . self-cooled propeller fans and universal blowers for large-volume circulation — there's a standard ILG unit designed to provide efficient flow of cool, refreshing air wherever it's needed. And, you'll find them all conveniently available through your nearby Graybar office.

Make fresh air your partner in production

Unit heaters, infra-red drying units, and accessories are distributed by Graybar. Combined with an efficient ventilating system, you can be sure of even heat distribution during cold weather. Your Graybar Representative will furnish you catalog and quotation information to help you make up project specifications and cost schedules.

You can make your plant a healthier, more comfortable place to work through adequate ventilation. By removing fumes, heat, dust, and stuffy air with efficient ILG ventilating units, you'll cut worker fatigue . . . reduce costly accidents and material spoilage . . . speed production all around.

Graybar-distributed ILG fans and blowers are the best-designed and best-built units you can provide. Call your nearest Graybar office for a free survey of your ventilation requirements — we'll be glad to work with you or your electrical contractor in the selection of the ILG equipment best suited to the job.

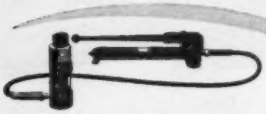
Remember, Graybar is an all-inclusive source for *everything electrical.* We distribute over 100,000 electrical items for wiring, lighting, communication, power, as well as ventilation. *Graybar Electric Co., Inc. Executive Offices: Graybar Building, New York 17, N. Y.* 236-114

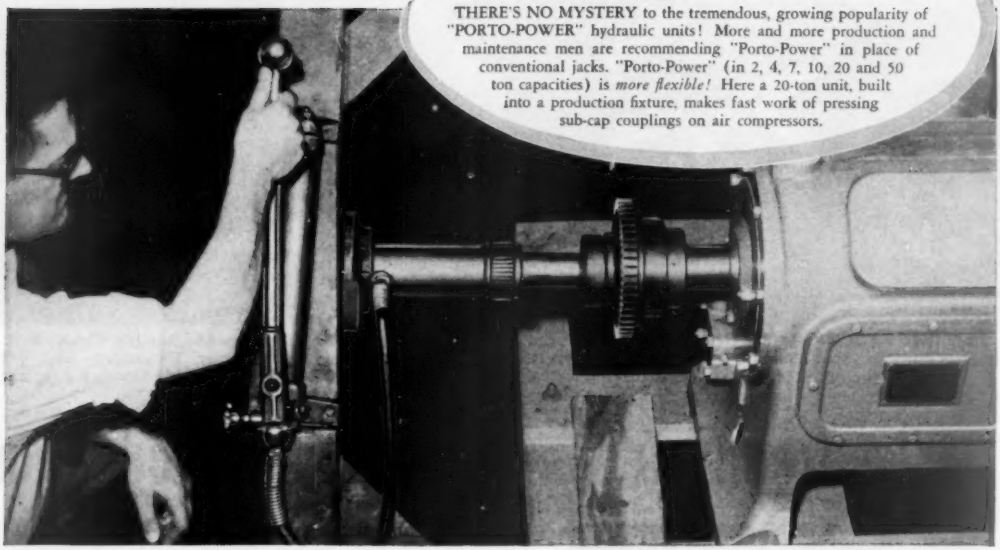
Call Graybar first for...

GraybaR Everything Electrical

IN OVER 100 PRINCIPAL CITIES

Use Porto-Power®
...industry's most versatile hydraulic tool





THERE'S NO MYSTERY to the tremendous, growing popularity of "PORTO-POWER" hydraulic units! More and more production and maintenance men are recommending "Porto-Power" in place of conventional jacks. "Porto-Power" (in 2, 4, 7, 10, 20 and 50 ton capacities) is *more flexible!* Here a 20-ton unit, built into a production fixture, makes fast work of pressing sub-cap couplings on air compressors.

...from the world's most complete line of hydraulic equipment

HYDRAULIC JACKS ...up to 100 tons

GAUGE-EQUIPPED JACKS

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WHEELED HYDRAULIC JACKS

"PORTO-POWER" REMOTE-CONTROLLED JACKS—PUSH & PULL

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HYDRAULIC PIPE BENDERS

HYDRAULIC KNOCK-OUT PUNCHES

YOU GET ALL THESE HYDRAULIC TOOLS ONLY FROM BLACKHAWK

BLACKHAWK

Yes, Blackhawk's famous "Porto-Power" offers you unmatched flexibility as a production or maintenance tool. With its all-directional hydraulic power . . . its separate pump and ram connected by a flexible hose . . . its wide variety of attachments — "Porto-Power" will lift, pull, press, clamp, bend or push.

Don't do it the hard way — *do it the hydraulic way!* Choose from the complete line of "Porto-Power" equipment. Hydraulic units are available with hand-operated or power-driven pumps and scores of work-saving attachments. Ask your Industrial Supply Distributor or write Blackhawk.

"Porto-Power" (trade mark registered) is made exclusively by Blackhawk Mfg. Co., Dept. P-2742 Milwaukee 1, Wisconsin.

So much easier... It's used more often

More people use Worthington's QD sheave than any other . . . because it's *easier*.

It's the only one on the market that gives you the choice of mounting in two pieces or preassembled.

It's the only one that makes switching sheave sizes really easy—the hub stays put, there's no realignment problem.

It's the only one with a *lock* to keep the shaft key from drifting.

You'll find it's *stronger*, too. Worthington is the only manufacturer to design each size individually for the load—rather than to proportion all sizes from one design. I-beam spokes carry heavier load with less weight.

Put Worthington QD on your drives and take a load off your men. Hubs and sheaves are available in a wide range of sizes and HP.

Worthington distributors carry complete range of stock sizes. The QD design is also licensed to other sheave manufacturers with dimensions standardized for interchangeability.

Write for Bulletin V-1400-B7F. Worthington Pump and Machinery Corporation, Multi-V-Drive Sales Division, Buffalo, N. Y.

1. Light hub goes on first . . .

2. Then heavier rim slides on

3. Or mount both hub and rim together

Worthington QD

Trade Mark Pat. No. 2369821

ORIGINAL TAPERED CONE-GRIP SHEAVE

Most Widely Used Hub and Rim Combination

Split hub is clamped to shaft. Heavier taper-bored rim slides easily over tapered hub—no keyway obstruction on cone surface. Positive press fit on shaft. Large, long pull-up bolts also used as jack screws to remove rim.

WORTHINGTON

THE GOOD RIGHT HAND OF INDUSTRY

POWER TRANSMISSION: sheaves, V-belts, variable speed drives

PUMPS: centrifugal, power, rotary, steam

AIR COMPRESSORS: water-cooled, air-cooled

MV.1.8A

How to speed up speed changes

an idea "Kicked in" by a WORTHINGTON DISTRIBUTOR

Pye-Barker Supply Co. of Atlanta comes through with *this* idea.

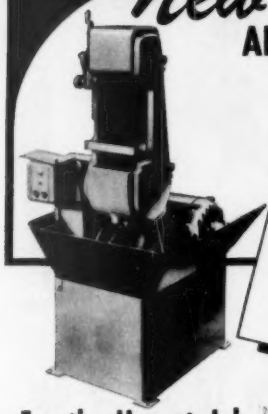
Many of its textile mill customers receive orders for yarns of different sizes. In processing these different sizes, speed changes—particularly on spinning frames—must be made often and quickly.

Pye-Barker, Worthington distributor, had the answer—Worthington QD sheave—the sheave that lets you change rims for speed variation without disturbing alignment. Why? Because the hub stays in place and the new sheave bolts easily and quickly in proper alignment.

To make the operation even faster, the textile mills painted the various rims a different color, one for each speed variation required—assuring the right rim, the right speed, and proper alignment.

Large Area Grinding at Low Cost

New Vertical-Horizontal **ABRASIVE-BELT Machine**



PORTER-CABLE
Model 506 Wet-Dry
COMPACT! RUGGED!
Adaptable to grinding and polishing operations on medium size pieces.
6″ BELT over 12½″ platen

For the Urgent Jobs, early delivery

Handles the jobs which previously required larger and more expensive machines in production lines, job shops, tool rooms, maintenance and repair departments. Only 56½″ high in vertical position. Working area, 6″ x 9″. Frame, heavy reinforced weldment and cast iron.

Adjusts Vertically or Horizontally in one minute to right position for free-hand grinding of flat surfaces, deburring, squaring, chamfering, rounding, polishing. Applications include wood, metal, glass, plastics. Built-in coolant system for wet grinding. (Model illustrated.) Interchangeable V-belt pulleys make possible most efficient cutting speeds.

Get Your FREE Copy of "Case Histories"—a 32-page fact-packed booklet with 46 examples — more than 100 illustrations — showing how abrasive belt grinding ups output and slashes costs. Mail coupon *today*.

Porter-Cable Machine Co.
1124 N. Salina St., Syracuse 8, N. Y.

Please send me: ☐ Complete information on new Model 506 Abrasive Belt Grinder
☐ Free copy of "Case Histories"

Name.....
Title.....
Firm.....
Address.....
City..... State.....

In Canada write: Strongridge Ltd., London, Ont.

HEAVY DUTY 10-TON WAYNE CRANE

saves 2 ways... { LESS MAN-HOURS / LESS MACHINE-HOURS

BECAUSE

either... SIMULTANEOUSLY or... INDEPENDENTLY

This "full functioning" feature of Wayne Crane eliminates stopping, clutching and shifting that waste time and cause unnecessary wear—results —more production, less costly downtime.

Eight-ton crawler and 12½-ton truck-mounted models also available. Write for specifications and prices. You'll like both.

WAYNE CRANE DIV., AMERICAN STEEL DREDGE CO. INC.
DEPT. F, FORT WAYNE, INDIANA

DRIVE-IT split second fastening anchored this electrical and communication ductwork to the concrete subfloor with considerable savings in man hours and dollars to the contractor. Over 8,000 drive-pins were used to hold the system in place while the finish floor was poured.

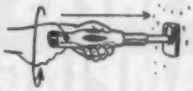
split-second fastening to concrete steel

EXCLUSIVE DRIVE-IT FEATURES

DRIVE-IT is the only powder-actuated tool approved by Underwriters' Laboratory.

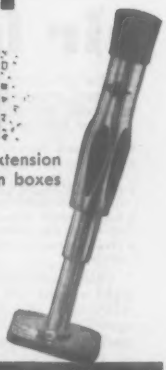
Exclusive Swivel Safety Pad easily rotated for getting into close quarter work.

DRIVE-IT is the only powder-actuated tool which requires but one standard power load regardless of penetration desired.



DRIVE-IT cannot be discharged accidentally due to the push and turn sequence. This, plus the large safety pad makes *DRIVE-IT* triple safe.

Exclusive Automatic Barrel Extension for fastenings inside junction boxes or other recesses.



Drive-it "300", lowest cost fastening tool.... Low original cost and low operating cost.

a drive-pin for every job

OVER 50 TYPES AND SIZES

MAIL THIS COUPON TODAY!

Powder Power Tool Corp.
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Portland 1, Oregon

☐ Please send FREE catalogue and literature.

☐ I want a FREE demonstration of *DRIVE-IT*.

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Street_____

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for safety

Keller Hoist handles drums of materials for a leather tannery

KELLER air hoist

The air-operated Keller Hoist assures complete safety to the operator as well as to the load. Design features include:

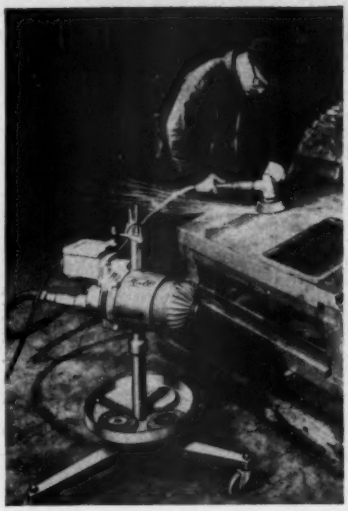
- Hooks and chain tested to 50% overload
- Safety stops to keep load within safe limits
- Powerful brakes prevent racing, keep load under complete control
- Load lowered without air—safe even if air line is disconnected
- Overload cannot injure motor, even if it stalls

Other hoist advantages are its light weight (30 lb*), small size (15" long, 5" diam*), variable speed (from a creep to 17 fpm*), and negligible maintenance.

**for 1000-lb hoist. Capacities of 300 and 2000 lb also available.*

KELLER
Pneumatic Tools
KELLER TOOL CO., GRAND HAVEN, MICH.

Less "Tool Handling"... More Production Means More Profit for You with MALL FLEXIBLE SHAFT MACHINES



Fast, lightest-weight power wherever you want it... vertically or horizontally. These are among the advantages of Mall units in dressing castings, grinding, drilling, buffing, sanding or polishing operations.

The Mall heavier-duty, constant speed motor gives you power reserve, nearly three times rated hp. on momentary overloads. Also, you get rugged machine construction. The shaft contains many layers of high carbon steel wire, wound under tension . . . treated to insure resilience. The strong spring steel liner of the housing provides a continuous shaft guide, preventing looping of shaft under load, protecting it from moisture, dust and injury.

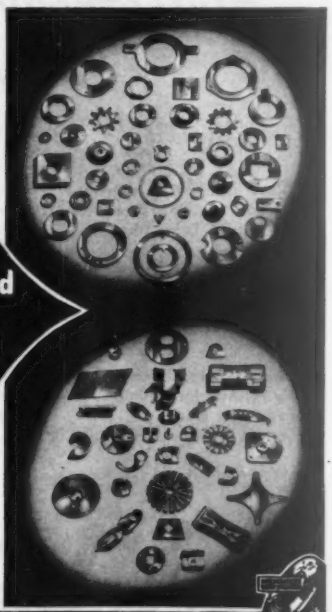
Write for folder describing all Mall Flexible Shaft Machines.

40 Factory-Owned Service Warehouses, Coast To Coast, To Serve Our Customers and Thousands of Dealers

More power to the pound . . . less pounds to handle.

Mall TOOL COMPANY
7733 S. Chicago Avenue
Chicago 19, Illinois

Serving INDUSTRY *since* 1887



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Standard and Special Washers, of every description, from every kind of material, any desired finish . . . designed for every purpose . . . utilizing more than 22,000 Sets of Dies.

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WROUGHT WASHER MFG. CO.
SINCE 1887
THE WORLD'S LARGEST PRODUCER OF WASHERS
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AVAILABLE NOW—196 pages of Valuable Tool Steel Information

A new Tool Steel Handbook—one of the most comprehensive treatises of its kind ever offered by a tool steel producer—has just been published by Allegheny Ludlum. In addition to a relatively complete picture of Allegheny Ludlum Tool Steels, their properties, applications and the forms in which they are available, this 196-page case-bound book presents an extensive discussion of heat treating and handling techniques as well as a complete set of weight tables and other useful reference material.

Your copy of the Tool Steel Handbook will be sent—*without charge*—upon request. Our only stipulation: please make your request upon your company letterhead. ● Write Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.

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Remember this also
America must have more
Scrap to make more Steel!
Get in the Scrap Now!

For complete **MODERN** Tooling, call
Allegheny Ludlum

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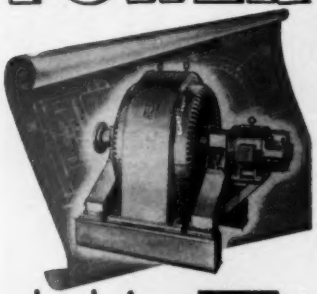
FINE TOOL STEELS
SINCE 1854

for
custom-engineered
POWER



look to... EP

Since 1909, the job of The Electric Products Company has been to create and develop special electrical rotating equipment . . . motors and generators to do existing jobs better or to reach into new fields to do jobs that couldn't be done before. The natural "by-product" of our more than 40 years of specialization is that you get equipment designed and built to the exact requirements of your application . . . equipment that has greater dependability, longer life and that requires less maintenance.

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A nation-wide sales engineering and service organization stands ready to meet all User requirements.

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Attach coupon to your letterhead for your copy of Bulletin 2-200

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2-56

Here's Efficient Welding . . . . . On C-F Positioners

When heavy, unwieldy weldments like these diesel crank cases can be quickly swung into any position so that every weld is made downhand—that's efficient welding!

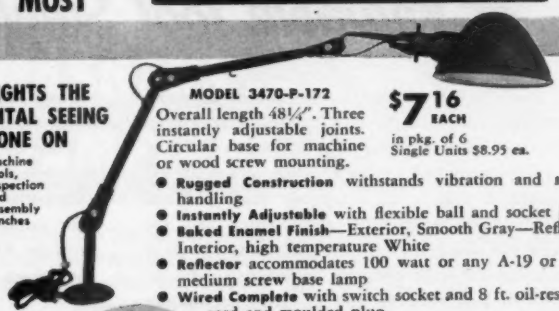
Welders spend more time welding—do better welding at lower cost when they work with C-F Positioners because these hand and/or power operated machines reduce positioning time to a minimum. Investigate the cost-saving advantages of C-F Positioners. They pay their way in any company.

Write for Bulletin WP24—an illustrated circular detailing the specific advantages of C-F Positioners.

CULLEN-FRIESTEDT CO.
1321 S. KILBOURN AVENUE CHICAGO 23, ILLINOIS

Light Where Light is Needed MOST

FOSTORIA
LOCALITES
Help Your Workers See Better



LIGHTS THE VITAL SEEING ZONE ON
Machine Tools, Inspection and Assembly Benches

MODEL 3470-P-172
Overall length 48¼". Three instantly adjustable joints. Circular base for machine or wood screw mounting.

$7.16 EACH
in pkg. of 6
Single Units $8.95 ea.

- **Rugged Construction** withstands vibration and rough handling
- **Instantly Adjustable** with flexible ball and socket joints
- **Baked Enamel Finish**—Exterior, Smooth Gray—Reflector Interior, high temperature White
- **Reflector** accommodates 100 watt or any A-19 or A-21 medium screw base lamp
- **Wired Complete** with switch socket and 8 ft. oil-resistant cord and moulded plug

LOCALITE fostoria for Light ON the Job
Reg. U. S. Pat. Off.

WRITE FOR COMPLETE CATALOG of Localite models with various type reflectors, arms and bases for every industrial use.

THE FOSTORIA PRESSED STEEL CORPORATION
FOSTORIA, OHIO

Localites are available through electrical wholesalers everywhere.

Why U. S. Rubber V-belts *cut overhead*

Savings in Maintenance: Inherent stretch is worked out mechanically in the factory; take-up is seldom, if ever, necessary. If required, the belt can be made oil-proof.

Savings in Power: Because U.S. Rainbow V-belts have practically no slippage, there is no loss of power between driver and driven machines.

Savings in Replacement: U.S. Rainbow V-belts last longer because they are not affected by moisture, cold, or heat.

To reduce any heat generated by constant flexing, and to get maximum adhesion between the component parts of the belt, the cords are treated with latex. Every U.S. Rainbow belt has the unique Equa-Tensil Cord Section—the U.S. Rubber development that insures sufficient pull and strength under diverse operations. Order from your jobber, or for more information, write to address below.

HITCH YOUR DRIVE TO A U.S. RAINBOW V-BELT

PRODUCT OF U.S. RUBBER — SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

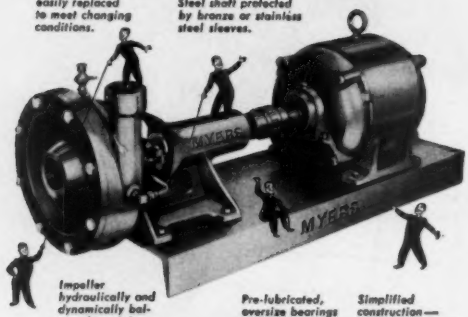
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

You Can See the extra value in NEW MYERS centrifugal pumps!

New Myers Direct-Connected Centrifugals: Available with or without motor. Sizes, ½ H.P. to 10 H.P.

Casing and impeller easily replaced to meet changing conditions.

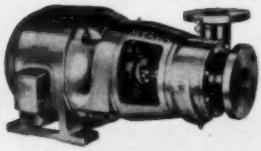
Steel shaft protected by bronze or stainless steel sleeves.



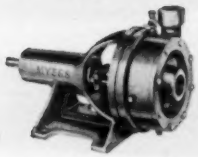
Impeller hydraulically and dynamically balanced—minimizes thrust.

Pre-lubricated, oversize bearings—extra durable.

Simplified construction—requires minimum installation space.



New Myers Motor-Mounted Centrifugals: Extra-compact. Exceptionally rugged. Sizes 1 H.P. to 20 H.P. Available in three material combinations—standard fitted, all-bronze and all-iron.



New Myers Belt-Driven Centrifugals: V-belt or flat-belt drive. Oversize shaft is removable from either end of pump. Types to handle many different liquids at temperatures to 220° F.

Steady volume . . . outstanding operating economy . . . smooth, trouble-free performance—you get them *all* in these new Myers Centrifugal Pumps. Line includes models that are ideal for general industrial applications—including drainage, booster service, air conditioning, etc.—also adaptable for irrigation and many other agricultural uses. All Myers Centrifugals are easily serviced. Capacities to 650 gpm. Write Dept. 7008-L1 for complete catalog and name of your distributor.

TAKE OFF YOUR HAT TO MYERS
PUMPS WATER SYSTEMS SPRAYERS HAY TOOLS

THE F. E. MYERS & BRO. CO.
146 Orange St.
Ashland, Ohio

CAPACITY FOR BIG JOBS! ACCURACY FOR ANY JOB!

16-24" x 6' Quick Change Gear Lathe

South Bend 16-24" Lathe

Here's a lathe with a versatility that makes equipment dollars go further. Its 24" swing provides the capacity for handling a variety of large diameter, medium weight jobs whose size would otherwise require large, heavy lathes. This extra capacity is achieved without any sacrifice of accuracy in the machining of smaller work. Having an unusually wide range of spindle speeds, all sizes of work can be machined at effective cutting speeds. The improved South Bend two lever gear box permits instant selection of power feeds for any turning, facing, or thread cutting operation. A complete line of chucks, tools and attachments simplifies the tooling for this lathe. *Write for catalog* on the 16-24" South Bend lathe.

SOUTH BEND LATHE • South Bend 22, Ind.
Building Better Tools Since 1906

SOUTH BEND
SOUTH BEND LATHES

Built to Resist Tube Swelling

...and to withstand toughest use

TUBE SECURELY LOCKED BY SPECIAL STAINLESS STEEL INNER WIRE BRAID

Illustration shows, in magnified detail, the exclusive protection feature—special stainless steel inner wire braid—you get only with CONCORD #20 STEAM HOSE. Promotes extra safety and longer hose life—fights tube swelling.

This famous BWH hose features a structural "exclusive" that's there for one purpose: *to fight tube swelling under continuous high pressure.*

Protection found only in CONCORD #20 STEAM HOSE, this consists of a tough inner lining of stainless steel wire braid. This helps assure retention of original inside hose diameter . . . acts against swelling and constriction of tube . . . promotes full flow of steam and easy recoupling in the field when necessary.

Other construction features of CONCORD #20 include: two or three braids (depending on size) of alternate high tensile steel wire and rubber layers firmly bonded over outside of tube . . . to provide maximum burst protection and safety; asbestos braid gives positive cover adhesion and serves as cover insulator; finally, the rugged, abrasion-resistant cover is built to withstand severest abuse.

FLEXIBLE . . . TOUGH . . . DEPENDABLE, that's CONCORD #20 STEAM HOSE. Put it to work for you now, get in touch with your nearby BWH distributor today.

BWH
DEPENDABLE RUGGEDNESS

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER CO.

Warehouse Stock: 111 N. Canal St., Chicago, Ill. Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

STOP WATER HAMMER!

with **WILLIAMS-HAGER** flanged *Silent check* **VALVES**

You can install Williams-Hager flanged Silent Check Valves in your water system in any position . . . horizontal, angular, vertical with flow upward or downward . . . and put an end to costly and annoying water hammer. Easy to install or reseat without special tools, they are durable and compact with easy accessibility and low friction. Available in standard pipe sizes from 1" to 20". Investigate the many features of these valves . . . and save!

CHECK VALVES

Write for Bulletin WH 851

Write today for your copy of this informative bulletin on Water Hammer, Its Cause, Effect and Control in Piping Systems.

THE WILLIAMS GAUGE CO.

3017 PENNSYLVANIA AVE. • PITTSBURGH 33, PA.

Save trash disposal COSTS with

BRULÉ FG4-T5 TRASH BURNER

Scientifically engineered

HERE is on-the-spot quick, dependable trash disposal—a unit that assures complete combustion, reducing 500 pounds of trash to 1 pound of ash—a unit that eliminates costly handling—that makes trash storage space available for other purposes—that operates without leaving odors or contaminating property. Only one door for all trash. Shipped complete, ready to install.

Operates on as low as an 18-ft. stack included with unit—stack is refractory lined, giving advantage of brick and economy of steel—it is simply bolted into place.

This organization has specialized in solving trash disposal problems by combustion for 40 years. Every service-proved feature is included in this unit. As an example, the brickwork within the unit is entirely suspended, which means no mechanical strain on wall and greatly increased service life.

Patented — Portable

PACKAGED UNIT

Capacity 500 lbs. per hour

BRULÉ INCINERATORS

(Bru-lay)

407 S. DEARBORN ST., CHICAGO 5, ILL.

Find Out fully, how scientific engineering has made this the perfect trash burning unit. Get the complete story on all important features. Ask for name of sales office nearest you.

Another PALMETTO PALCO *Success Story*

GAEDE DYEING CO.
Paterson, N. J.

CHIEF ENGINEER: Ralph Allan

DATA: DeLaval Centrifugals. Operating conditions — 3600 RPM, 90 ft head pumping through filter, cold spring water 1200 gpm, 40 hp motor, shaft 1-1/2", 3/8" PALMETTO Palco packing. Repacking every 2-3 yrs during routine inspection.

REMARKS: *never had to repair or replace a shaft sleeve in 20 years!*

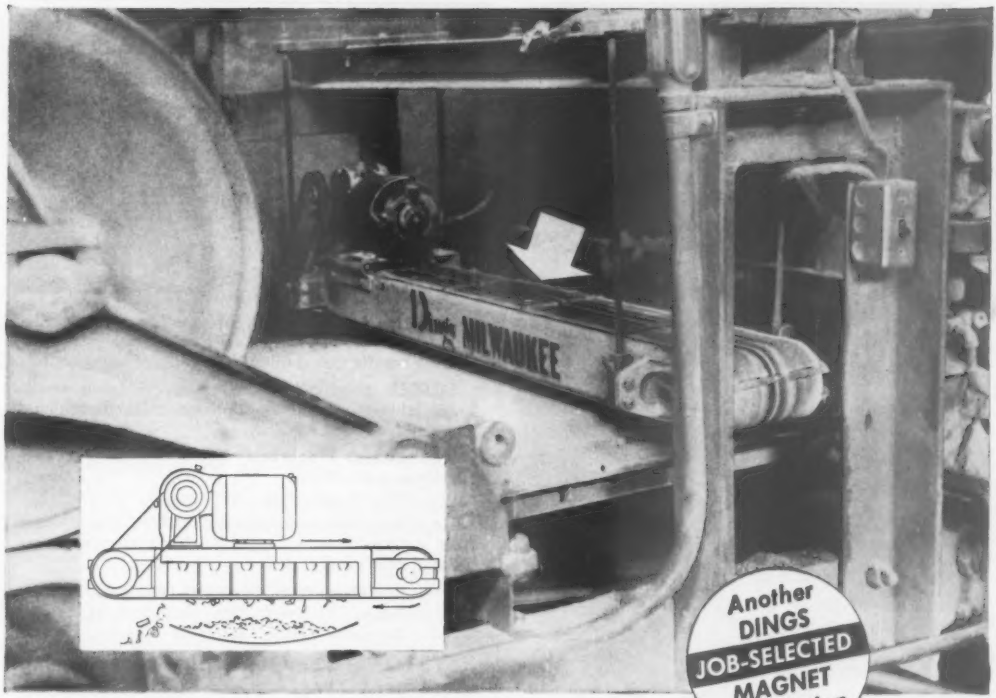
PALMETTO *Packings*

This outstanding packing is made from soft, long-line, high-tensile cotton roving individually impregnated by the exclusive Palmetto process. *Palmetto Palco cannot score . . .* Cotton fibres burn out if the gland is inadvertently drawn too tight. For centrifugals pumping water or any neutral fluid where temperatures are not in excess of 275 F specify Palco—the packing designed for the assignment. Write for Catalog PC-101—the Palmetto answers to packing problems.

packing more performance into every application

GREENE, TWEED & COMPANY

NORTH WALES, PENNSYLVANIA



Another DINGS JOB-SELECTED MAGNET Installation

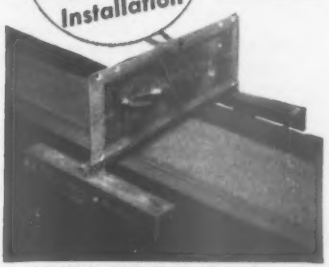
ASBESTOS MINUS IRON EQUALS SALES GOLD

DINGS MAGNETS DO THE SUBTRACTING

HOMEOWNERS like the superior quality of asbestos shingles but if the shingles don't look like wood, they won't buy, says one of the biggest manufacturers of asbestos building materials in the business. So the shingles are passed through engraving rolls to give them the textured appearance of wood. A problem raised by this process and solved by a Dings self-cleaning non-electric Perma-Plate magnet (big illustration) is TRAMP IRON—nuts, bolts, wires, etc. which get in the asbestos during previous processing. This iron would wreck the rolls, alter the pattern and eventually cause rust spots in the installed material. The Perma-Plate gets it all out—automatically.

WHY was the Perma-Plate selected for this job over all other types and styles of magnets in the Dings line? *The specific application dictated its choice.* The magnet was "job selected." Whatever YOUR tramp iron problem, buy a Dings job selected magnet and KNOW it will be successful.

DINGS MAGNETIC SEPARATOR COMPANY
4712 W. Electric Ave., Milwaukee 46, Wis.

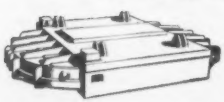


THE PERMA-PLATE (shown here without self-cleaning attachment) is non-electric, permanently magnetic. This magnet is particularly effective where the burden depth does not exceed 3".

THIS CATALOG HELPS YOU TO "JOB SELECT" A MAGNET

Is the material you want de-ironed a solid . . . semi-solid . . . liquid? Is it carried in chutes . . . ducts . . . conveyor belts? Catalog 5000-B lists Dings complete line by application, describes all Dings magnets from the low cost, non-electric "Perma" Plate magnet to the most powerful magnetic separators known. Send for it today.

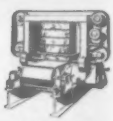
DINGS MAGNETS


Rectangular

High Intensity Induced Roll

Non-Electric and Electric Pulleys

Non-Electric Drums


High Intensity Type EBK Crossbelt

Is Your Sound System "DATED"?

IN THE DAYS of tri-cornered hats a hearty voice could be heard in even the largest factory. But today, with machinery and hundreds or thousands of employees, the hearty voice is out-dated and a modern high quality sound system is essential for safe and economical plant operation.

With an **ALTEC** sound system the quick dissemination of facts and orders to every employee in any or all parts of your plant saves time and money. Music played during the hours when fatigue and boredom are high can reduce accidents and increase productivity. In case of disaster your Altec sound system can avert panic and save lives and equipment.

Hundreds of factories, offices, stores, airports, stations and entertainment places have found that only Altec has the quality and diversification to fulfill every requirement for sound equipment. Whether you have ten or ten thousand employees, you should have an Altec sound system. It will save time, money and lives.

ALTEC Sound Systems are an intelligent business investment

Call your Altec dealer or write...

ALTEC
LANSING CORPORATION

8356 Santa Monica Blvd.
Beverly Hills, Calif.

161 Sixth Avenue
New York 13, New York

How Much is YOUR PLANT losing because of

POOR VISION?

A sampling test, of a few of your own employees, will show how a Visual Testing program will give you the results that thousands of plants are reporting:

LOWER production costs and training costs; lower labor turnover; less spoilage; reduced accidents and insurance rates.

INCREASED efficiency, larger profits; increased employee satisfaction.

Write for *sample test* of a few of your below-average employees—or for *"What You Can Expect from a Good Vision Program,"* by a prominent industrial personnel director.

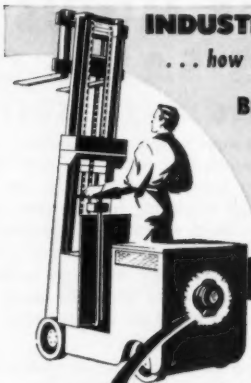
KEYSTONE VIEW COMPANY, Meadville, Penna. Established 1892. Originators of Binocular Vision Testing in Industry.

KEYSTONE *Occupational Visual Service*

INDUSTRIAL TRUCKS

. . . how to tell when they are

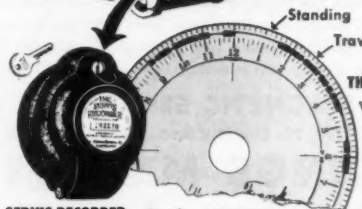
Busy?
Idle?
Lifting?
Engine Running?



PUT ON

Servis Recorders

A couple of screws or bolts does the job. Then the truck itself *writes its own story!*



THE CHART

Wax covered, no ink or pencil needed; a sapphire stylus marks the record—a picture of the day's work at a glance.

SERVIS RECORDER—closed. Just bolted on—no connection with any moving part.

Write for Bulletin IT

THE SERVICE RECORDER COMPANY
1375 Euclid Avenue • Cleveland 15, Ohio

new metallizing handbook

CLOTHBOUND
LIST PRICE $3.00
plus postage on C.O.D. orders

comprehensive 250-page volume covers all phases of this modern metal spraying process

This completely new metallizing handbook contains 250 pages of "how-to" information, including the very latest developments in the re-surfacing of worn machine parts, corrosion protective coatings, and specialized metallizing applications. Profusely illustrated with pictures, diagrams and charts, this new text is an invaluable reference for anyone concerned with metal working and the maintenance of machines, as well as with iron and steel structures and exposed equipment.

PARTIAL LIST OF CONTENTS

MACHINE ELEMENT WORK
- Surface Preparation—General
- Sprabond Wire—Surface Preparation
- METCO Method of Shaft Preparation
- Rough Thread Method
- Grit Blasting Method
- Spraying
- Inside Diameter and Flat Surfaces
- Sealing Sprayed Coatings
- Finishing

CORROSION RESISTANT COATINGS
- Selection of Coatings
- Surface Preparation
- Spraying Technique
- Sealing Technique
- Finishing Corrosion Resistant Coatings

VENTILATION
- Lathe Exhausts
- Spray Booths
- Dust Collectors, etc.

MISCELLANEOUS METALLIZING APPLICATIONS
- Blow Holes in Castings
- Brazing and Soldering
- Glass and Ceramics
- Mass Coatings in Barrels
- Misc. Non-Metallic Materials
- Model Work
- Electric Circuits

METCO SPRAYWELD PROCESS
- Metco-Weld H Coatings
- Composite Sprayweld Coatings

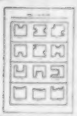
ENGINEERING DATA
- Physical Properties of Sprayed Metals
- Bond Strengths
- Useful Data Charts

SAFETY MEASURES

INDEX

PROFUSELY ILLUSTRATED

DIAGRAMS — over three dozen clear diagrams of "how-to-do-it" information.



PHOTOS — show preparation methods, spraying operations, new equipment and accessories, new applications, etc. Includes many photo-micrographs showing characteristics of metallized coatings.

CHARTS — clearly show the effects of various gas and wire-speed adjustments, spraying distances, etc. Also, show stress, strain and shrinkage curves for sprayed coatings of various materials.

TABLES — aid in the selection of correct spraying metals, cutting tools and recommended rake angles, machine feeds and speeds, recommended grinding wheels and their characteristics, blasting methods and materials. Tables are also included in order to aid in estimating costs.

The following names are the property of Metallizing Engineering Co., Inc.: Sprabond Wire, Sprayweld, Metco-Weld H, Metco®. *Reg. U.S. Pat. Off.

METALLIZING ENGINEERING CO., INC.
38-14 30th STREET — LONG ISLAND CITY 1, N. Y.
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Send for your copy today

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Please send me_____copies of the new Metallizing Handbook.

☐ C.O.D.
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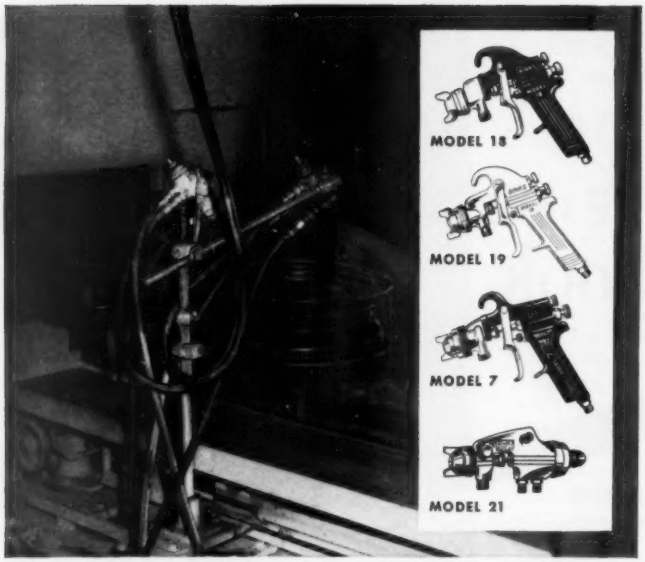

Set-up for the automatic finishing of vehicle wheels with Binks Model 21 spray guns. Guns cut off automatically between units and do not spray when empty spindle passes.

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Maybe your job involves a special finish or coating for military equipment...or finishing wood and/or metal surfaces on a fast schedule... or coating with flock. Whatever the need, if it involves spraying, Binks has a gun for it...more than 36 models with some 1050 nozzle combinations. Here are the four leaders:

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Here's a pocket-size guide to overcoming common troubles in spraying. Trouble and remedy are described in simple, easy-to-absorb words. An invaluable aid to foremen, supervisors, instructors in industry, government, armed forces, etc. As many copies as you need, FREE. Write, on your business letterhead please, for "SPRAY PAINTING HINTS." Address: Binks Manufacturing Co., 3114-34 West Carroll Ave., Chicago 12, Ill.

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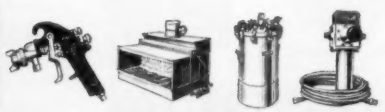
EVERYTHING FOR SPRAY PAINTING



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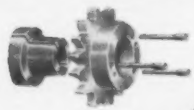
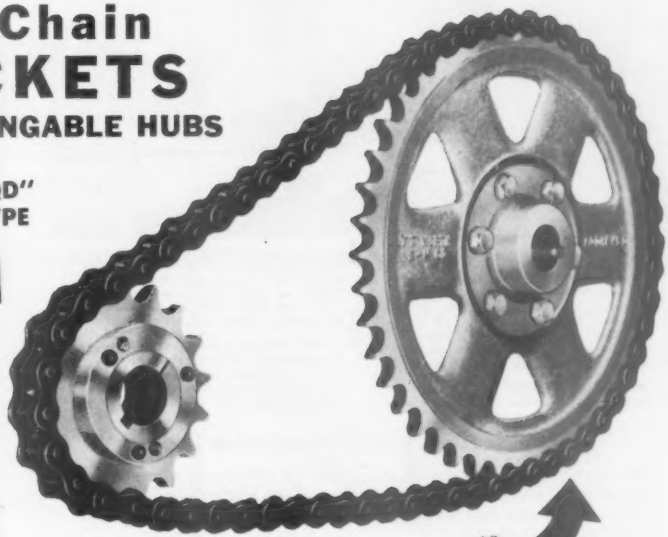
Roller Chain SPROCKETS

WITH INTERCHANGABLE HUBS



"QD" TYPE



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"DH" TYPE

FORT WORTH *Sprockets Offer Many Advantages*

QD ACTUALLY FITS SHAFT BETTER
Tapered split hub actually grips shaft for a positive press fit. Will accommodate an undersized shaft.

SIMPLIFIES CHANGES
Many sprockets use same hubs; therefore, speed changes are quickly and easily made at a saving in price. Change of sprocket bore can be accomplished with new hub.

CUTS REPLACEMENT COSTS
Replacement sprockets can be used on old hub, which reduces cost of replacement sprocket.

REDUCES COST OF "SPARES"
Relatively few sprockets and hubs can be carried as spares to fit many drives in the plant and thus prevent costly shutdown time with minimum inventory.

JUST OFF THE PRESS

CATALOG 300-C

Shows list prices and dimensions of stock QD & DH sprockets. Chain dimensions and drive recommendations are in easy-to-use form. Write today.

HUBS ALSO FIT FORT WORTH TRANSCO V-Belt Sheaves

OTHER FORT WORTH PRODUCTS

V-BELT DRIVES
SCREW CONVEYORS and ACCESSORIES
SCREW ELEVATORS
INDUSTRIAL FANS

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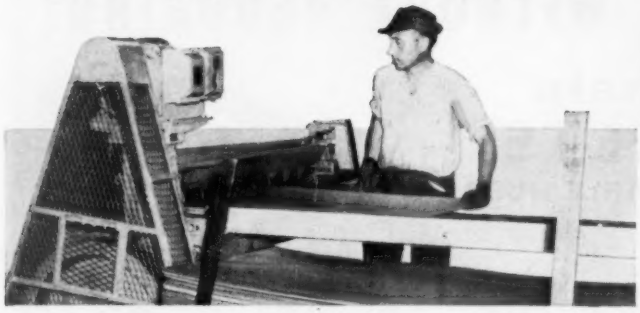
FACTORY WAREHOUSES — HOUSTON, LOS ANGELES, KANSAS CITY, ST. LOUIS, CHICAGO, MEMPHIS, ATLANTA, DALLAS, JERSEY CITY

78% fewer hand injuries and 6¢ per man-hour cost saving

follow management study of work gloves



Case No. 207—Problem: Company employing over 1000 men, to shear, form and dip-coat sheet steel products, found production penalized by frequent hand injuries from cuts, heat and acid burns, and resulting infections. Double canvas gloves, used to handle sheets, averaged 4 hours' wear at a cost exceeding 10c per man-hour.

Management Solution: Operations study by an Edmont specialist and on-the-job tests leading to adoption of gloves with tough natural rubber coated palms and thumbs to handle dry sheets, and gauntlets heavily coated with NEOX (reinforced neoprene) for hot galvanized metal and acid baths.

A 78% reduction in hand injuries followed the change-over. The safer gloves also were 3 to 5 times longer, at average cost-saving of 6c per man-hour. (Name of manufacturer furnished on request.)

Hands are Important Production Tools

Our case records of hundreds of operations with sharp, abrasive or slippery materials, with and without the presence of heat, oils, acids, caustics, solvents and degreasants, prove that correct work glove selection results in:

Fewer lost-time accidents • Faster, surer work handling Less spoilage • Improved job attitude • 40% to 70% savings in usual glove costs to companies or employees

There's a correct glove for every job Good management makes it available

Maximum Protection and Safe Grip
Extremely tough coating of NEOX (reinforced neoprene) over sturdy, sweat-absorbing, insulating fabric. Non-slip safety grip.

Heavy or Standard Weight Coatings
Various weights of NEOX coatings on fabric, overall or palm-and-thumb coated only.

Non-Slip Natural Rubber Coated
Comfortable, safer and wear 5 to 10 times longer than canvas gloves.

Vinyl Plastic Coated Work Gloves
High resistance to abrasion, oils, many chemicals. Retain flexibility.

We offer consulting service on specific problems or complete plant surveys:

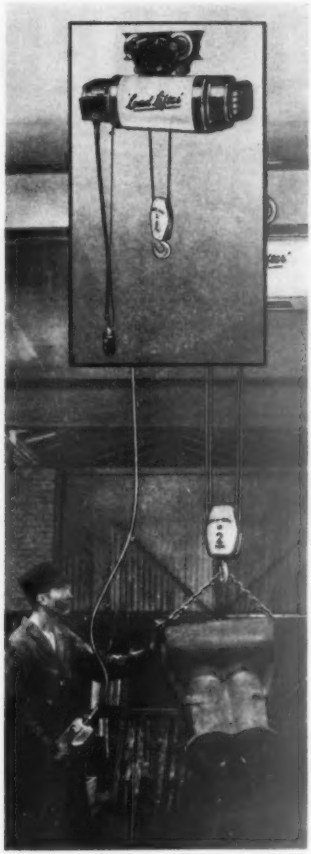
(Used by Ford Motor, General Electric, Union Carbide & Carbon, Continental Can, H. J. Heinz, Westinghouse and many others.)

Without cost or obligation we will gladly study your hand-protection problems and practices, make recommendations and furnish the procedures and materials for complete on-the-job tests. For full information, write our Safety Engineering Service.

Edmont

Edmont Manufacturing Company
1212 Walnut Street, Coshocton, Ohio

World's largest maker of coated industrial gloves



FAST LIFTING SPEEDS OUTPUT!

The fast lifting action of the "Series 700" 'Load Lifter' Electric Hoist shortens handling time. Manpower can process more units per day for less.

Keep your production at high levels around the clock. Put this heavy-duty 'Load Lifter' on the job. Push-button control with only 24 volts at the push button, wipes out muscle strain, increases safety, and maintains worker efficiency. Simple design and rugged construction assure long life in the severest service. Capacities: 1,000 pounds upwards. Single and two-speed control available. Bulletin No. 399 contains all the facts. Write for a copy.

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'Load Lifter' ® **HOISTS**

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Builders of "Shaw-Box" Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' Industrial Instruments.

How would you solve it?

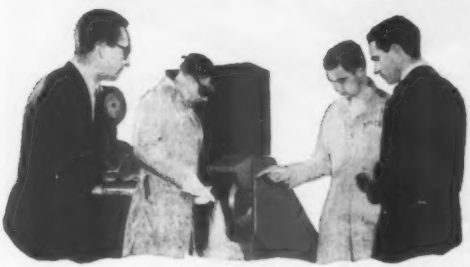
Production problem:

Break a "bottleneck" caused by standard weld-removal methods on cold-rolled steel stator shells

1 Here's what Century Electric Company, Saint Louis, Missouri, did. They turned their weld-removal problem over to a 3M Methods Engineer, who studied the problem with Century Electric specialists and came up with a solution.

2 3M's recommendation was a conversion to backstand equipment with fast-cutting abrasive belts. A specially engineered contact wheel was recommended—plus the right abrasive belt, grit size, and operating speed.

3 Now Century Electric uses the 3M Method to finish stator shells 800% faster than with the previous equipment. Production has jumped from 15 to 125 pieces per hour with smoother finishes too!



4 3M maintains Demonstration Rooms in principal cities throughout the country, where abrasive engineers will demonstrate how you can cut *your* grinding and finishing costs. For additional information on the 3M Method, write for a copy of the "Step UP Production" booklet, Dept. FMM-452, Minnesota Mining and Manufacturing Co., St. Paul 6, Minnesota.

3M® ABRASIVE BELTS

See 3M Company's TV Program "JUVENILE JURY" on NBC Network

Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn. — also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Adhesives. General Export: Minn. Mining & Mfg. Co., International Division, 270 Park Avenue, New York 17, N. Y. In Canada: Minnesota Mining & Mfg. of Canada, Ltd., London, Canada.

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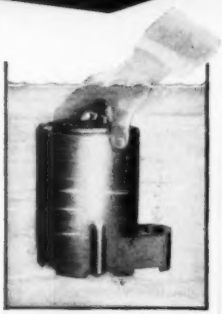
PUMP AND MOTOR COMPLETELY SUBMERSIBLE



SMALL BUT MIGHTY

is the KENCO MODEL P-104 CIRCULATING PUMP! It's only 7¼ inches high by 5-13/16 inches wide, but at zero head, it pumps 1000 GPH, and 435 GPH at 7' head! Most important, the P-104 like all other KENCO pumps is completely submersible! Motor is hermetically sealed for perfect heat dissipation, and both motor and pump are sealed in a rugged housing of cast iron or bronze.

IDEAL for THESE USES and MANY MORE:

- Circulation of numerous liquids.
- Coolant applications.
- Transferring ink, lubricants, oil, alcohol, cleaning fluids.
- All high capacity, low head, close quarter uses.

Eliminates complex pump-belt-motor combinations and complicated plumbing, because it can be placed directly into liquid!

Available with automatic NO-FLOAT KENCO SWITCH!

AVAILABLE for EARLY DELIVERY!

Send me the facts on the KENCO Submersible Circulating Pumps and the name of my nearest jobber!

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I am interested in
☐ Name of my nearest jobber.
☐ Specification and performance data.
I need a pump to handle_____at_____GPH
(specify liquid)
capacity at_____foot head.

Name_____
Company_____
Address_____
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SILVER PLATING

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Purposes of silver plating need not be explained to you of the electrical field.

The biggest problem of silver plating is its convenience, economy and thoroughness.

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the best WHITE TAPE made at the lowest price yet

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Makers of Evans Folding Rule and "The Folding Yardstick"

How would YOU control costs here?

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Electric Temperature Control and Detection Devices

SENSITIVE . . . *but only to heat*

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LEADING designers of machinery and equipment find the use of standard Johnson Sleeve Bearings to have outstanding advantages. They find that these bearings can be utilized in 90% of their applications. One decided advantage, of course, is the low cost of Johnson GP Bearings. You, too, may well consider switching to these bearings for your product.

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Here's how to prevent costly coolant spoilage and eliminate foul odors: ask your DOLGE Service Man to take samples of your coolant for *free* bacteriological and chemical analysis. A complete laboratory report will show the correct coolant handling method for *your particular operation.*

Only if tests warrant it will a DOLGE STERIDOL GERMICIDE be recommended — a "tailor-made" preparation to meet *your exact needs.* Used as directed it will not irritate the skin or corrode metals. The cost?—Far less than a cent per gallon of coolant!

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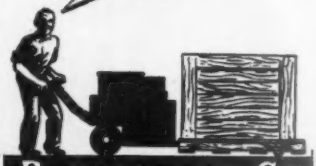
Dependable DOLGE

WESTPORT, CONNECTICUT

FREE!

Revolvator's new Truck Index helps you pick size, capacity and type to suit your needs. Send coupon today.



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Position.....

Company.....

Address.....

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THE CHANGEOVER TO NESTIER

— the modern system for materials handling —

CAN BE MADE IN YOUR PLANT TODAY!

Now, at last, scientific design has been applied to the "tote box." With the NesTier, we offer a new system—a new technique—that works wonders in speeding up the flow of work on any production line.

From stock room to loading dock, the NesTier System, including racks, hand trucks, dollies and conveyor hangers, is designed for your plant. And the NesTier is designed to work with your present equipment—lift or fork trucks, overhead or roller conveyors and pallets.

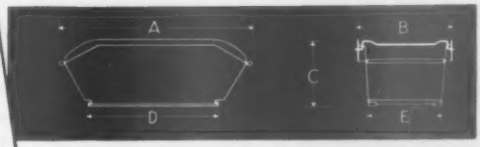
In less than nine months, the NesTier has replaced antiquated equipment in many plants, both large and small, including: General Electric Co., U.S. Army, U.S. Navy, Douglas Aircraft, International Harvester, Westinghouse Electric, The Formica Co., Fusite Corp., Chrysler Corp., International Business Machines Corp., and The Hallicrafters Co.

IT NESTS

NesTiers nest when empty to save space. Rails prevent complete telescoping, eliminate possibility of units jamming or sticking together.

IT TIERS

Rails lock units together to form a rigid stack. Parts in all units are visible and accessible from either end.



SPECIFICATIONS

Nestier	gauge	weight	bails	A	B	C	D	E
No. 175	18 ga.	6 lbs.	¼" dia.	18⅛"	9⅛"	6⅞"	11⅝"	7"
No. 220	16 ga.	15 lbs.	⅝" dia.	22⅝"	12⅛"	7¾"	14⅛"	8½"

IF YOU HANDLE SMALL PARTS, SEND FOR THIS FREE BROCHURE

This interesting brochure, which fully explains the Nestier System, how it cuts costs and speeds up production, will be sent free on request. Please ask for Form 42.

NESTIER®

THE CHAS. WM. DOEPKE MANUFACTURING CO., INC.

Metal Specialties Division

ROSSMOYNE, OHIO, U.S.A.

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If you need quick delivery of stainless steel fastenings, check Anti-Corrosive first! Although most of our production requires D. O. Ratings, there is still a wide variety of stock items in our bins which may fit your needs . . . or, a suitable alternate ready for *immediate delivery* may be suggested!

FREE-A-N SELECTOR!

Write TODAY for handy Slide Chart No. 52J . . . instantly identifies A-N Nos. pertaining to stainless steel fastenings, gives sizes and other data. Free catalog also available.

Anti-Corrosive Metal Products Co., Inc. 1927–1952

Manufacturers of STAINLESS STEEL FASTENINGS

CASTLETON-ON-HUDSON, NEW YORK

your plant LOST ONE HOUR of production TODAY!

PROTECTRON saves the Lost Hour and **STEPS UP OUTPUT** of your present equipment **12½% to 22%**

Here is a typical LOST HOUR

"Breaks to obtain stock"	18	min. LOST
Coffee and Coke "breaks"	21	min. LOST
Rest and Smoke "breaks"	21	min. LOST
	60	min. LOST

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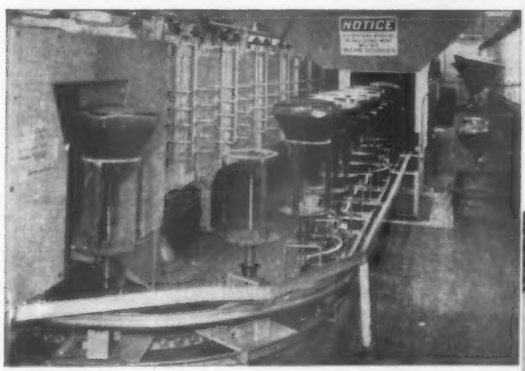
GAS supplies the Radiant Heat that

INCREASED TV tube PRODUCTION 33⅓%

at ALLIED ELECTRIC PRODUCTS, Inc.

Sheldon Electric Division, Irvington, N. J.



Radiant Heat Gas-fired burners in this furnace at Allied Electric Products provide exact heat distribution and are readily and precisely controllable to fire all tube sizes.

Conveyor-carried television tubes enter Gas-fired radiant heat oven where screen phosphors and internal conductive coating are baked to remove excess moisture and gases.

MODERN GAS EQUIPMENT has increased TV tube production 33⅓% for Allied Electric Products, Inc. The precise temperature control which GAS permits, plus new ease of loading and unloading designed into this Modern Gas Installation has helped boost production from 75 to 100 units per hour.

GAS-FIRED RADIANT HEAT UNITS line the heating zone of the baking furnace, and are adaptable to the tube size . . . the smaller the tubes, the fewer the units utilized. These Gas-fired Radiant Heat units

- Heat the tubes as rapidly as possible without breaking
- Bake the phosphors and internal conductive coating

GAS IS THE MODERN FUEL FOR ALL INDUSTRY because Modern Gas Equipment fits readily into production lines, because GAS is clean, economical, and allows absolute control over heating and cooling cycles. Get the facts about Modern Gas Installations for your plant. See your Gas Company Representative today.

AMERICAN GAS ASSOCIATION

420 LEXINGTON AVE., NEW YORK 17, N. Y.

New

BUDA "FT" SERIES Fork lift trucks

"MODERN DESIGN" LINE WITH ALL THE ADVANCED FEATURES

14 STANDARD MODELS...

2 Capacities to 7500 lbs.

BUDA DIESEL or Gasoline Engine Power

1 MORE POWER—High torque, heavy duty Industrial Type Buda Diesel or gasoline power.

2 SPECIAL SECTION MAST—equipped with rollers and anti-friction bearings—eliminates high stresses, sliding friction, and resultant scoring.

3 CARRIAGE—quick adjustable side thrust rollers—permits side thrust adjustment without shimming.

4 OPERATOR CONVENIENCE—all controls standard and conveniently located; instruments grouped in one indirectly lighted panel in front of operator.

5 HYDRAULIC 2-WHEEL BRAKES—self-energizing for safe, easy braking.

6 REINFORCED "U" CHANNEL SECTION FRAME—high underclearance to eliminate "snagging" on inclines, tracks or uneven surfaces.

7 HEAVY DUTY QUICK CHANGE CLUTCH—changed in approximately 30 minutes without removing transmission, axle or engine.

8 HIGH, SAFE, LOAD-WEIGHT CAPACITY—Balanced design and safe distribution of weight for maximum lifting and carrying capacity, increased traction and greater maneuverability.

9 "WIDE OPEN" FUNCTIONAL DESIGN—engine and hydraulic system quickly accessible for servicing . . . sides and counterweights easily removed for complete maintenance.

PLUS 37 other completely new design and operating features which make the new Buda FT Series Fork Lift Trucks "Tops" in material handling equipment. Ask your nearby Buda Distributor for complete details on the "Modern Design Line" today. Write for Bulletin 1570 and specification data. The Buda Company, Harvey, Ill.

BH-38A

The Line with All 3 for Diversified Handling

BUDA

PLATFORM TRUCKS · TOWING TRACTORS · FORK LIFT TRUCKS

Manufacturers of Material Handling Equipment, Lifting Jacks, Maintenance of Way Products, Earth Drills and Diesel and Gasoline Engines

SAVE SPACE WITH

FAB-WELD

ALL-STEEL PALLET RACKS

Every inch of available storage space is made possible by using FAB-WELD All-Steel Pallet Racks. Designed for palletized unit loads. Rugged construction for all ceiling heights.

OTHER FAB-WELD STANDARD PRODUCTS

Steel Pallets ● Collapsible Bin Boxes ● Special Stackable Pallets ● Dump Hoppers ● Skids and Bin Boxes ● Car Bridge Plates ● Heavy Duty Industrial Trailers ● Floor Trucks

SEND FOR FREE CATALOG AND COMPLETE INFORMATION.

FAB-WELD CORPORATION

RICHMOND & VENANGO STS.

PHILADELPHIA 34, PA.

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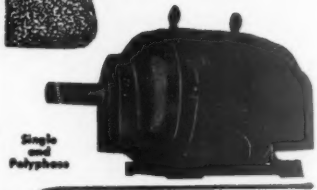


Fully enclosed Ball Bearings; semi-enclosed construction that protects against dripping and splashing hazards and assures cool, continuous operation. Available in polyphase—from ½ to 60 hp, single phase—from ½ to 5 hp, for wide adaptability of use and greater flexibility in your power planning.

Write for Complete Details Today

VALLEY

ELECTRIC CORPORATION

Take advantage of exclusive P&H AC Dial-lectric principle

give your production a lift

— with safe, open-circuit voltage . . . easy, quick-start arc . . . time-saving, built-in remote control . . . compact AC design

Armor plate welding calls for low-hydrogen or stainless steel electrodes. P&H, pioneer in the low-hydrogen field, also offers the AC welder that gives you the best weldability with these rods — for greater production.

Your men like the P&H AC Dial-lectric — like its safety under the most adverse conditions; like the easy, quick-start arc, the elimination of arc-blow. And they get more done! Get sounder, better looking welds in less time, thanks to built-in remote control which lets them select the right heat at the work, turns *walking time* into *welding time*.

Because these welders give production such a lift, P&H has stepped up its delivery schedules to meet defense demands without delay. Get your production rolling in high gear. Order your P&H AC Welders today. Capacities up to 650 amps. Take advantage of this delivery situation while it lasts.

P&H **WELDING DIVISION**
4573 W. National • Milwaukee 14, Wis.
HARNISCHFEGER CORPORATION

WILLSON®

comfortable eye protection

keep you on the safe side

WILLSON GOGGLES

Willson goggles offer you greatest value because they are carefully designed for comfort and appearance as well as for the eye protection you need. Choose from a wide range of Cup and Cover-All® types like those illustrated. All are fitted with Super-Tough® heat-treated glass lenses—all fully pre-tested. You're *sure* when you ask for Willson goggles—*safer* when you wear them.

COVER-ALL® CUP GOGGLE No. CC60

Heavy duty goggles allowing plenty of room for prescription glasses to be worn safely and comfortably.

RUBBER MASK GOGGLE No. X41

Ideal for chemical workers. Rolled inner edge makes them fit snugly with utmost ease.

STYLE DL31

Deep perforated metal cups provide direct ventilation yet exclude dust. Ideal for use in hot, dusty atmospheres.

See your WILLSON distributor or write for bulletin

WILLSON PRODUCTS, Inc., 218 Washington St., Reading, Pennsylvania

RELAX

you can depend on EMERY

Emery's revolutionary new AIR PROCUREMENT SERVICE gets your air shipments from any point in the Nation **faster and more dependably than ever before with just a simple 'phone call!**

EMERY AIR FREIGHT CORPORATION

"The World's Fastest Transportation System"

Offices in all principal cities in the U. S. Consult your 'phone book

BLOW WHISTLES
RING BELLS automatically

Montgomery

PROGRAM CLOCKS and INDUSTRIAL TIMERS

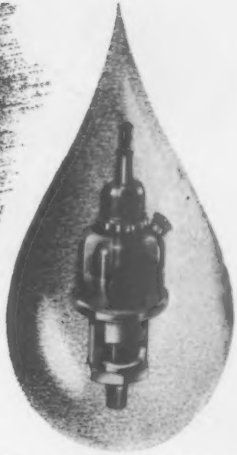
PAYS FOR ITSELF quickly — by controlling accurately all working schedules. Install for less than $100.00. Make your manual system automatic, replace unreliable program clock, install new system.

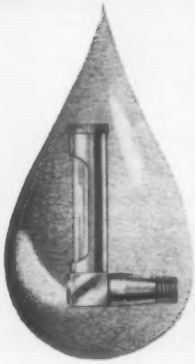
MONTGOMERY MANUFACTURING CO.

Owensville 10, Indiana

Open time available on new Fellows 7125A Gear Shaper for precision gear cutting, 96 pitch and courser.

For Lubricating Devices Call On GITS First!





GITS Bros. covers the *entire range* of lubricating devices: Oil Hole Covers, Oil Cups, Grease Cups, Bottle Oilers, Gauges. Gravity-Feed, Wick-Feed, Constant Level, Vibrating Rod styles. Threaded or Drive-type. Elbow or Straight.

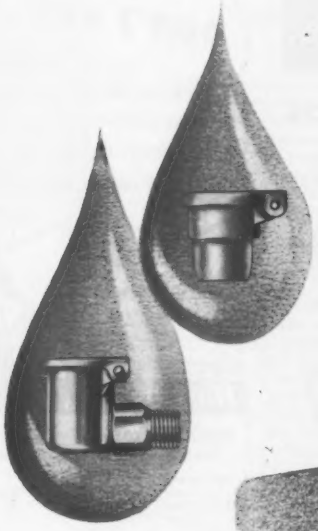
GITS Bros. offers the most complete selection of standard styles.

GITS consistent quality in design, materials and machining has made Gits Lubricating Devices the standard for industry for more than 40 years.

GITS Lubricating Devices are far-famed for solving tough oiling problems at low cost.

GITS Bros. Engineering Staff—true specialists in lubrication engineering—is at your disposal.

Write today for free illustrated Catalog No. 60-A. Use it as your handy reference for lubricating devices.



GITS BROS. MFG. CO.

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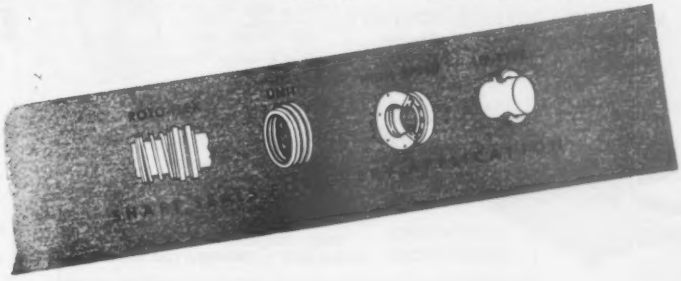
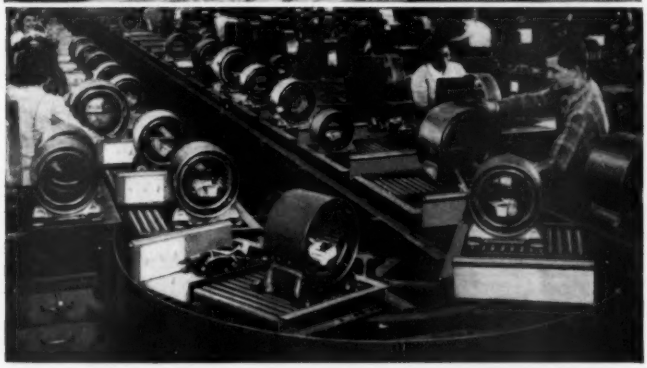


IF YOU HANDLE OR ASSEMBLE MANY PIECES—PARTS—UNITS—ITEMS—ARTICLES—AS PART OF YOUR PRODUCT...



Standard Conveyors can speed operations

Keeping things moving — avoiding "bottle-necks" — on production, assembly, processing or packaging lines can be done better, faster, and cheaper *mechanically* with conveyors.

Your needs in conveyors — ranging from power and gravity conveyors, roller, belt, slat, chain, push-bar, sectional — to portable, self-contained conveyors — spiral chutes — pneumatic tube systems — can be met at Standard, with a conveyor experience record of more than 45 years. Write — Address Dept. FM-42.

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul, Minnesota
Sales and Service in Principal Cities

Write Dept. FM-42 for Standard's General Catalog and tell us what you want to convey.

ROLLER • BELT • SLAT • CHAIN • WHEEL
PUSH-BAR • SECTIONAL
PORTABLE CONVEYOR UNITS:
HANDIBELT • HANDIPILER
INCLINEBELT • LEVEL BELT • EXTENDOVEYOR
UTILITY BELT-VEYOR • HANDI-DRIVE
VERTICAL LIFTS • PNEUMATIC TUBE SYSTEMS

INDUSTRIAL TRACK

Need Rails—Switches—Frogs—Guard Rails—Track Tools? For best selections, prompt deliveries—*try FOSTER*—shipments from stock in 5 nationwide warehouses.

Call on FOSTER for everything in Industrial Track Equipment and supplies.

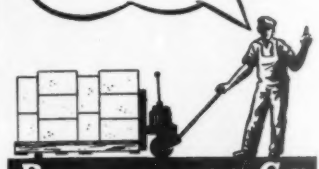
RAILS New and Relaying
Send for Track Equipment Catalog # F-4

L. B. FOSTER CO.
STEEL SHEET PILING • PIPE • WIRE ROPE
PITTSBURGH 30, PA. NEW YORK 7, N.Y.
CHICAGO 4, ILL. HOUSTON 2, TEX.

DON'T BUY...

any lift trucks until you check your needs against Revolvator's new Truck Index.

Send coupon today.



REVOLVATOR CO.

REVOLVATOR CO.
8661 Tonnele Ave., North Bergen, N. J.

Gentlemen:
We want to know, without obligation, all about Revolvator Red Giant Liftrucks.

Name .....
Position .....
Company .....
Address .....

. . . YET SCRAP INVENTORIES ARE ALARMINGLY LOW. YOU ARE BEING COUNTED ON TO HELP KEEP THE FURNACES WORKING . . . TO AID DEFENSE

With our increased steel production, the furnaces are gobbling up an enormous amount of iron and steel scrap.

More—far more—scrap than is at present going into their scrap stockpiles.

Many mills are operating on a hand-to-mouth basis. Some are already threatened with shutdown—for lack of scrap.

The Danger Is Increasing

Will efforts to fill the tremendous demands for steel fail because of lack of scrap?

Steel is made from 50% scrap. We could be severely handicapped—in our aim to keep abreast of both military and civilian requirements—if scrap suppliers can't keep pace with productive capacity.

But they *can* keep pace . . . with your help!

Enough Scrap IS Available!

Yes—the only problem is to get the available extra scrap from where it is—to where it's needed.

Where is it?

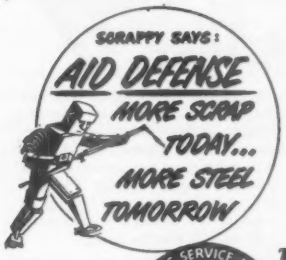
In *your* business . . . in the form of old machines and equipment, tools, implements, dies, jigs, fixtures, outmoded structures, chains, valves, wheels, pulleys—any old iron and steel that's rusting away.

Six Million EXTRA Tons Needed!

By the end of 1952, we'll be producing steel at an annual rate of 20 million tons more than in 1950. That means we will need at least 6 million more tons of scrap than we've ever needed before.

It's up to you. Write at once to Advertising Council, 25 W 45 St., New York 19, N. Y., for a free copy of "Top Management: Your Program For Emergency Scrap Recovery".

Please write today—there's not a day to lose.



NON-FERROUS SCRAP IS NEEDED, TOO!

This advertisement is a contribution, in the national interest, by

McGRAW-HILL PUBLISHING COMPANY, INC.

330 WEST 42nd STREET NEW YORK 18, N.Y.

Single Track OR Double Track?

You'll agree that double track makes for faster, smoother, more efficient railroading. Likewise, in business, two telephone systems are better than one! . . . Your regular city 'phones for incoming and outgoing calls, *and* SELECT-O-PHONE for all *inside* communications! SELECT-O-PHONE is automatic, operates independently of your switchboard, permits you to talk with from one to 55 inside stations, individually or collectively!

SELECT-O-PHONE helps expedite orders, frees your switchboard—saves time and money, increases operating efficiency! Get the facts—and you'll get SELECT-O-PHONE!

SELECT-O-PHONE Dial Intercommunication Systems are sold, installed and serviced by factory trained, exclusive, franchised dealers all over America.

KELLOGG

Select-O-Phone

THE INSIDE VOICE OF BUSINESS

Get the Facts—Mail Today!

SELECT-O-PHONE DIVISION
Dept. 12-D
Kellogg Switchboard & Supply Co.
6650 So. Cicero Ave., Chicago 38

Please rush your new "Hear's How" booklet that explains how I can benefit from Kellogg SELECT-O-PHONE Dial Intercommunication.

Name_____

Company_____

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City_____ Zone____ State_____

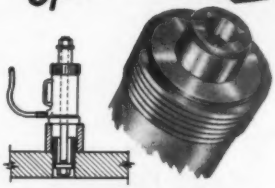
Simplifies PULLING!

LESS RIGGING NEEDED! LESS SET-UP TIME! SAVE THE TOOL COST ON ONE JOB!

The New SIMPLEX Re-Mo-Trol Hydraulic Pumps and Remote Controlled Rams "Center-Hole"* PULLERS

The only remote control puller offering this time and work saving advantage! Just insert a pull rod or screw through the tubular ram and secure it to the object to be pulled. Rod is drawn through ram as plunger extends, in a direct-line pull. No complicated rigging. Ram is its own back-up. Sketch shows typical use removing sleeve.

Exclusive "Center-Hole"* Speeds the Job!



If it can be pulled, Re-Mo-Trol can pull it easier! Pulls gears—wheels—pinions—axles—shafts—sleeves—liners—studs. Operates as shown with center pulling screw, or pull rods and bracket. Or use it for any kind of conventional lifting or pressing job. Seven complete units—10 to 100 tons capacity.

*On Rams of 30-tons or greater capacity

PUMPS AND RAMS *Interchangeable*

Two pumps—seven rams. Smaller pump handles all Rams up to 30 tons capacity, larger pump handles any Re-Mo-Trol Ram. You can buy only the units you actually need!

Simplex
LEVER • SCREW • HYDRAULIC
Jacks

Write for Bulletin: Hydraulic 51 for full information

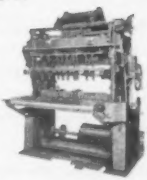
TEMPLETON, KENLY & CO. • 1018 South Central Avenue, Chicago 44, Illinois

Automatically LIDS MIXED SIZE BOXES

fmc RANDOM SIZE BOX LIDDER

up to 600 per hour

The *fmc* Random Size Box Lidder meets the demand for a nailing machine which lids boxes of mixed sizes fed from a common conveyor. One operator can lid up to 600 boxes per hour on this fast and versatile machine. As boxes of mixed sizes are fed into the machine it automatically adjusts to the proper size, drives the required number of nails and discharges the lidded box on an outgoing conveyor, taking the place of several nailing machines which would otherwise be required to handle the same volume and variety of production.

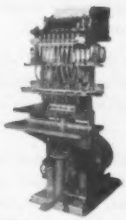


fmc INDUSTRIAL EDGE NAILER

Includes most features of standard Industrial Center-Line Nailer with special chuck arrangement which permits work to pass in front of the machine as well as through it. Designed for edge nailing, crate and box framing, cleating.

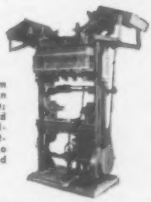
fmc INDUSTRIAL CENTER-LINE NAILER

Designed for large scale industrial nailing — wide pattern selection. Picks and drives up to 24 nails per stroke; all type nails, 3d to 10d. Open back machine; standard widths 48", 66"; others available.



fmc CLOSED BACK FC NAILER

Accommodates work from 1" to 18" deep, 8 run nail feed; 8 nail drive; handles 4d, 5d and 6d nails. Ideal for flat nailing, box making, cleating and lidding; also ammunition box end making.



fmc AMMUNITION BOX MAKER (AC-5A)

Adjustable heavy duty machine for nailing sides and bottoms in three strokes to ends of various types of ammunition and industrial boxes no larger than 16" high, 16" wide and 26" long.

OTHER fmc NAILING MACHINES...

SEND FOR ILLUSTRATED BULLETIN

FOOD MACHINERY AND CHEMICAL CORPORATION

PACKING EQUIPMENT DIVISION • RIVERSIDE, CALIFORNIA

Dept.____

RANDOM SIZE LIDDER ☐
CENTER-LINE NAILER ☐
EDGE NAILER ☐
FC NAILER ☐
AC-5A NAILER ☐

NAME _____

STREET AND NO. _____

CITY _____ STATE _____

NM-20 B

Installed on the mezzanine floor at Courtaulds (Canada) Limited are 15 large compressors and vacuum pumps, all supported on special Korfund steel spring vibro-isolators. This view of a portion of the mezzanine shows the method of mounting this battery of I-R and York equipment.

...by controlling vibration

For best plant and machinery layout, and for lowest construction costs, Courtaulds and its engineers, Robert A. Rankin Co., wanted to construct a new building in a central location—*with this heavy equipment on a mezzanine floor.* Since this rayon plant is almost completely automatic in operation, however, they had to be absolutely certain that no transmitted vibration would upset delicate electronic controls.

Korfund engineers designed special spring-isolated bases for the pumps and compressors, and Courtaulds was able to place them on the mezzanine with no disturbance transmitted to other floors or to electronic controls.

Courtaulds saved the extra cost of piling for each foundation which would have been necessary for the usual basement installation, and obtained better plant layout. *In fact, Courtaulds reported that Korfund isolators more than paid for themselves in reduced construction costs alone.*

For less exacting installations, there are standard stock Korfund isolators. A selector chart in Bulletin G-104 gives recommendations for both normal and critical conditions, for pumps, compressors, centrifuges, machine tools, presses, hammers, and most other processing and mechanical equipment. See Sweet's Catalog Files, or write us for your free copy today.

We'll gladly submit recommendations without obligation. Just contact us, or the Korfund representative you'll find in most principal cities. A half century of experience is at your disposal.

KORFUND VIBRATION CONTROL — SPRINGS · RUBBER · CORK

Representatives in Principal Cities

THE KORFUND COMPANY, INC.

48-35C Thirty Second Place • Long Island City 1, N. Y.

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AERONAUTICAL
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LOCKHEED

AIRCRAFT CORPORATION
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MARIETTA, GEORGIA

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available in LOCKHEED'S long-range program for Engineers with successful experience in aircraft design, electronics, flight test, research, or liaison — or production work.

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Mr. Frank J. Johnson, Employment Mgr.
5941 Peachtree St., Atlanta, Ga.

IF A PERSONAL INTERVIEW
is arranged, you will be reimbursed for transportation expenses

AND
should a job with LOCKHEED result, your moving expenses will be reimbursed.

LOCKHEED offers vacations with pay; low cost group life, health, accident insurance; sick leave with pay; credit union for savings and low cost financing; employees' recreation club; regular performance reviews to give you every opportunity for promotion; on-the-job training or special courses of instruction, where needed.

(If you prefer the West Coast, your inquiry will be promptly forwarded to LOCKHEED at Burbank, California, where similar openings are available.)

WHERE TO BUY

Featuring many cost-cutting products to help solve production problems

STOP DUST

DUSTKOPS — **22 Models**
UNIT TYPE — 300 cfm to 10,000 cfm
LOW COST — ¼ hp to 15 hp.

AVAILABLE FROM STOCK
For: Grinders, buffers, polishers, woodworking, lint . . . **ALL DUSTS**
Send for Cat. 605f; describe problem for recommendation by return mail, without obligation
AGET-DETROIT CO. • ANN ARBOR, MICH.

BALDWIN-HILL INSULATIONS

INDUSTRIAL INSULATION

A complete line of Mineral Wool Insulations for service from Sub-Zero to 1800° F.
Mono-Block, Felts, Blankets, Koldboard, Pipe Covering
B-H No. 1 Cement
B-H Powerhouse Cement

BALDWIN-HILL COMPANY
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- Promote new products
- Establish new sales outlets
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- Find new markets
- Find new uses

Write now for information on how you can do it easily and economically through this Section.

Classified Advertising Division
FACTORY MANAGEMENT & MAINTENANCE
330 West 42nd Street
New York 36, N. Y.

MISCELLANEOUS EQUIPMENT

Begins on page 172

Flexible Hose

Wire-reinforced Flexaust will stand up under heavy flexing, says its maker. Made of neoprene and nylon, the new hose can be used on pressure or vacuum lines, and in heavy-duty applications involving abrasive dusts. Sizes range from 1½- to 24-in. outside diameters.

American Ventilating Hose Co., 100 Park Ave., New York 17.

■

SANITARY SCREW CONVEYORS with no lap joints or crevices to accumulate dirt are being made by the Kornylak Engineering Corp., 513 Communipaw Ave., Jersey City 4, N.J. Joint between screw flight and shaft is continuously welded, ground to a smooth fillet, polished to No. 4 finish.

■

AIR BLAST BREAKER CUBICLES made by Brown Boveri Corp., 19 Rector St., New York 6, are factory assembled, completely wired units. They come ready to set on foundations and connect into the circuit. You can get this switchgear with ratings from 7.2 to 23 kv., 250 to 1½-million mva.

Pipe Repair CLAMPS

Made for every type of leak—any temperature or pressure. Send for Catalog No. 41-0.
M. B. SKINNER CO., SOUTH BEND 21, INDIANA

STOP *that* WATER

WITH FORMULA NO. 640. A clear liquid which penetrates 1" or more into concrete, brick, stucco, etc., seals—holds 1250 lbs. per sq. ft. hydrostatic pressure. Cuts costs: Applies quickly —no mixing—no cleanup—no furring—no membrane. Write for technical data—free sample. Haynes Products Co., Omaha, Neb.

AS IT BEGAN '29 — ALLEN — '52

FLUX for
SODERING
SILVER SODERING
WELDING
BRAZING

L. B. ALLEN CO., INC.
6781 BRYN MAWR AVE., CHICAGO 31, ILL.

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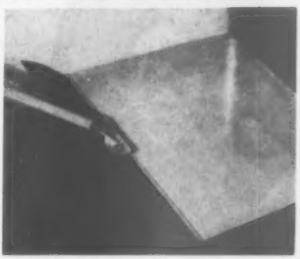

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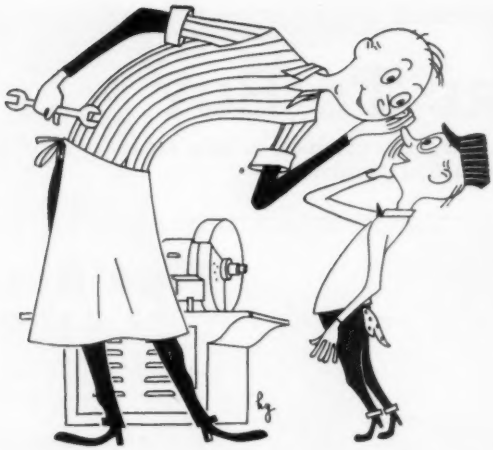

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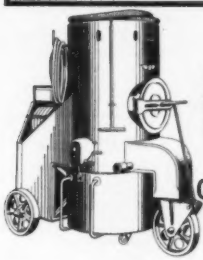

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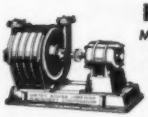

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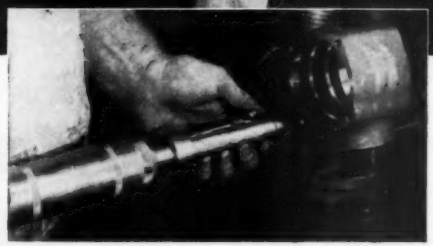

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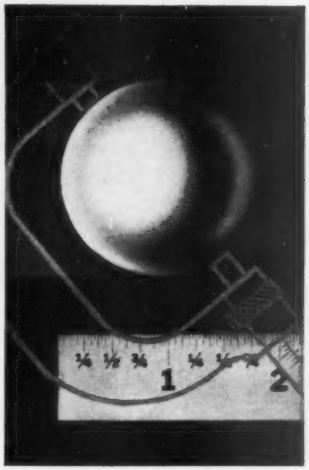

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Index To Advertisements

This index is a service to readers. Every effort is made to maintain its accuracy, but FACTORY MANAGEMENT and MAINTENANCE assumes no responsibility for errors or omissions.

Abrasive Products, Inc. 212
Acme Industries, Inc. 260
Acme Steel Company 54
Adam Electric Co., Frank B-30, B-31
Addex Corporation B-197
Aget-Detroit Co. 311
Ahlberg Bearing Co. 202
Airtemp Div., Chrysler Corp. 273
Air Express Div., Railway Express 258
Alemite Div., Stewart-Warner 257
Allegheny-Ludlum Corporation 283
Allen-Bradley Company Insert 32, 33
Allen Company, Inc., L. B. 311
Allis-Chalmers Mfg. Co. 9, B-34, B-35, B-36, B-37, B-38
Allis-Chalmers (Tractor Div.) 200
Allen Ventilator Div., Production Planning Co. B-176
Altec Lansing Corp. 290
Aluminum Company of America B-186, B-194
American Abrasive Metals Co. 224, B-155
American Bitumuls & Asphalt Co. B-156
American Blower Corporation B-171
American Gas Association 301
American Mutual Liability Insurance Co. 40, 41
American Optical Company 209
American Screw Company 21, 262
American Smelting & Refining Co. 155
Anaconda Wire Cable Co. B-32
Anchor Post Products, Inc. (Fence Div.) B-170
Angier Corp. 134
Ansul Chemical Company 154, 184
Anti-Corrosive Metal Products Co. 300
Appleton Electric Company B-33
Aro Equipment Corporation 207
Atlantic Screw Works, Inc. 262
Atlas Screw & Specialty Corp. 154
Automatic Transportation Co. 15
Avco Manufacturing Corp., Lycoming Spencer Div. 242

Baker-Raulang Company 7
Baldwin-Hill Company 311
Barreled Sunlight Paint Co. 19
Barrett-Cravens Co. 62
Barrett Div., Allied Chemical & Dye Works B-195
Bassick Company 253
Bausch & Lomb Optical Company 169
Bay State Abrasive Products 167
Behr-Manning Corporation 203
Belgian Electric Sales Corp. B-39
Benbow Mfg. Co. B-29
Benjamin Electric Mfg. Co. 52, 53
Binks Manufacturing Co. 292
Black & Decker Mfg. Co. 197
Blackhawk Mfg. Co. 278
Blake & Johnson Company 262
Bostitch, Inc. 160
Boston Woven Hose & Rubber Co. 287
Bowers Battery & Spark Plug Co. 136
Bradley Washfountain Co. B-5
Breuer Electric Manufacturing Co. 264
Bridgeport Chain & Mfg. Co. 218
Brighton Screw & Mfg. Co. 189
Brinnell Company 300
Brown & Matthews, Inc. B-15
Brown & Sharpe Mfg. Co. 244
Brule' Incinerators, Inc. 288
Brunner Mfg. Co. 132
Buchanan Electric Products Corp. B-52
Buckeye Tools Corporation 314
Buda Company 302
Bunting Brass & Bronze Co. 36
Bussmann Mfg. Co. B-40, B-41

Cambridge Wire Cloth Co. 268
Camcar Screw & Mfg. Corp. 262
Carborundum Company 24, 25
Carey Mfg. Co., Philip B-137
Carrier Corp. 201, B-175
Central Screw Company 262
Century Electric Co. B-43
Certified Ballasts Manufacturers B-46
Chicago Pneumatic Tool Co. 56
Cities Service Oil Company 179
Clarage Fan Company B-160
Clark Controller Co. B-42
Clark Equipment Co. (Industrial Truck Division) 28, 29
Cleco Div., Reed Roller Bit Co. 256
Cleveland Chain & Mfg. Co. 218
Cleveland Crane & Engrg. Co. (Cleveland Tramrail Div.) Insert B-138
Coffing Hoist Company 180
Colson Corporation 213
Columbus-McKinnon Chain Corp. 236
Cone Automatic Machine Co. 141
Continental Electric Equipment Co. B-44, B-45
Continental Screw Company 262
Continental Steel Corp. B-156
Cool-Amp 296
Coppus Engineering Corp. 33
C-O-Two Fire Equipment Co. B-178
Crane Company 17
Crotty Brothers, Inc. 215
Cullen-Friestedt Co. 284

Darnell Corporation, Ltd. 240
Day Company 276
Day-Brite Lighting Co. B-52
Dayton Rubber Company 34, 35
Dearborn Chemical Co. 163
De Laval Separator Company 217
De Laval Steam Turbine Corp. 44, 45
Delco Products Div. of General Motors Corp. B-47
Delta Power Tool Div., Rockwell Mfg. Co. 14
Deming Company 166
Detroit Steel Products Co. B-8, B-179
De Vilbiss Company B-2, B-3
Diamond Chain Company, Inc. 272
Diamond Power Specialty Corp. 234
Dings Magnetic Separator Co. 289
DoAll Company 50, 51
Dodge Manufacturing Corp. 231
Doepke Mfg. Co. Inc., Chas. Wm. 299
Dolge & Co., C. B. 298
Dow Chemical Co. (Magnesium Dept.) 238
Dow Chemical Co. (Pentachlorophenal Div.) B-14
Dow Corning Corporation 131
Douglas Fir Plywood Assn. B-142
Dowell, Inc. 125
Dracco Corporation B-16
Dravo Corporation B-158, B-159
du Pont de Nemours & Co., E. I., Kinetic Chemical Div. 146
du Pont de Nemours & Co., E. I., Rayon Division 271
Duriron Company, Inc. 159

Eagle Lock Company 262
Ebasco Services, Inc. B-192
Edison Storage Battery Div., Thos. A. Edison, Inc. B-29
Edmont Manufacturing Co. 294
Elco Tool & Screw Corp. 262
Electric Controller & Mfg. Co. B-48
Electric Products Company 284
Electric Storage Battery Co. 121
Electro Dynamic Div., Electric Boat Co. B-49
Elliott Company (Crocker-Wheeler Div.) B-51
Elwell-Parker Electric Co. 12, 13
Emery Air Freight Corp. 304
Evans & Company 296

Fab-Weld Corporation 302
Factory Management & Maintenance B-196
Fafnir Bearing Company Second Cover, Part I
Fairbanks-Morse & Co. 143, 181
Farval Corporation 320
Fedders-Quigan Corporation B-184
Feedrail Corporation B-50
Felters Company 176
Fenwal, Incorporated 297
Finnell Systems, Inc. 183
Flash-Stone Co., Inc. B-163
Flintkote Co. (Industrial Products Div.) B-185
Food Machinery & Chemical Corp. 309
Foote Bros. Gear & Machine Corp. 251
Foote Gear Works, Inc., Brad 178
Fort Worth Steel & Machinery Co. 293
Foster Co., L. B. 306
Fostoria Pressed Steel Co. 138, 284,
Fulton-Sylphon Co. 60

Gardner-Denver Company 245
General Box Company 190
General Cable Corporation B-148, B-149
General Electric Company (Apparatus Dept.) B-22, B-23, B-24, B-24a, B-26, B-27, B-28, B-28a, B-28b
General Electric Company (Construction Materials Div.) B-25
General Electric Company (Electronics Dept.) 195
General Electric Company (Heavy Duty Cleaning Equip.) B-186
General Electric Company (Lamp Dept.) B-24b
Gerrard Steel Strapping Div., United States Steel Company 248
Gifford Wood Company B-182
Gits Bros. Mfg. Co. 305
Goodrich Company, B. F. 1, 6
Goodyear Tire & Rubber Co. 16
Gould-National Batteries, Inc. B-54
Graton & Knight Company 193
Graybar Electric Company 277, B-55
Great Lakes Screw Corp. 262
Great Lakes Steel Corp. (Stran Steel Div.) B-123
Greene, Tweed & Co. 288
Grinnell Company, Inc. B-10, B-145
Gulf Oil Company 18

Hansen Manufacturing Company 233
Hapman Conveyors, Inc. 270
Harnischfeger Corporation 227, 303
Harper Co., H. M. 262
Haynes Products Co. 311
Hinde & Dauch Paper Co. 4
Holcomb Mfg. Co., J. I. B-150
Honan-Crane Corp. 263
Horn Company, A. C. B-11
Hotpoint, Inc. (Commercial Equipment Dept.) 177
Howell Electric Motors Co. 63
Hudson Pulp & Paper Corp. 20
Hyatt Bearings Div., General Motors Corp. 129
Hyster Company 247

Imperial Brass Mfg. Co. 211
Independent Pneumatic Tool Co. 265
Inland Steel Co. B-6
International Packings Corp. 193
International Steel Company B-132
Invincible Vacuum Cleaner Mfg. Co. 235
ITE Circuit Breaker Corp. B-57

Jeffrey Manufacturing Co. 46, 47
Jenkins Bros. B-9
Johns-Manville Corp. B-161
Johnson Bronze Company 298
Johnson Steel & Wire Co., Inc. 206
Jones & Lamson Machine Co. 187

Kalman Floor Co., Inc. B-184

Keasbey & Mattison Co. B-187
Keller Tool Company 65, 282
Kellogg Switchboard & Supply Co. 308
Kelley-Mahorney Co. B-144
Kenco, Inc. 296
Kennedy Car Liner & Bag Co. 270
Kennedy Valve Mfg. Co. B-134
Kentile, Inc. B-191
Kester Solder Co. 164
Keystone View Co. 290
Kex National Service 246
Kidde & Co., Walter B-183
Kimberly-Clark Corporation 264
Kinnear Manufacturing Co. B-138
Kinney Manufacturing Co. 192
Klein & Sons, Mathias 292
Kohler Company B-147
Kold-Hold Mfg. Co. 210
Koppers Company B-165
Korfund Company, Inc. 310

Lamson & Sessions Company 237, 262
Le Blond Machine Tool Co., R. K. 42, 43
Legge Co., Inc., Walter G. B-172
Lewis-Shepard Products, Inc. 55
Lincoln Electric Company 219
Lincoln Engineering Co. 265
Link-Belt Company 8, 57, 157
Lockheed Aircraft Corp. (Georgia Div.) 310
Lufkin Rule Company 274
Lunkenheimer Co. B-125
Lyon Metal Products, Inc. 259

Mahon Co., R. C. B-7
Mall Tool Company 282
Manhattan Rubber Div., Raybestos Manhattan, Inc. 199
Manning, Maxwell & Moore, Inc. 294
Master Electric Company Fourth Cover, Part I
Master Builders Co. B-172
Masury-Young Company B-177
McCaskey Register Company 124
McGraw-Hill Publishing Co. 30, 31
McGraw-Hill Book Co. B-28b, B-53
Mechanical Handling Systems, Inc. 162
Metallizing Engineering Co., Inc. 291
Micro-Switch Corporation 223
Mico Products 311
Mid-States Gummed Paper Co. 151
Miller Company Third Cover, Part II
Mills Company B-135
Milwaukee Electric Tool Corp. 170
Minnesota Mining & Mfg. Co. 145, 196, 295, B-152
Mississippi Glass Co. B-12
Mixermobile Distributors 222
Mobilift Corp. 174
Modine Mfg. Co. B-4
Monarch Machine Tool Co. 161
Monarch Rubber Co. 5
Montgomery Mfg. Co. 304
Morse Chain Company 173
Muller Machinery Co., Inc. B-188
Multi-Clean Products, Inc. B-140
Myers & Bro. Co., F. E. 286
Mystik Adhesive Products 232

National Lock Company 262
National Screw & Mfg. Co. 262
Niagara Blower Company B-168
Norton Company Fourth Cover, Part II

Ohio Brass Company B-151
Ohio Hoist Mfg. Co. 218
Oil-Dri Corporation of America B-164
Osborn Mfg. Co. 10
Owens-Corning Fiberglas Co. 37, 38, 39, B-133
Owens-Corning Fiberglas Co. (Electrical Sales Div.) B-58, B-59

Pangborn Corporation 148, 149, 274
Parker-Kalon Corp. 262
Pheoll Mfg. Co. 262
Pittsburgh Coke & Chemical Co. 165
Pittsburgh-Corning Corp. B-143, B-162
Pittsburgh Plate Glass Co. (Paints Div.) B-17
Plating & Galvanizing Co. 218
Porter, Inc., H. K. 156
Porter Cable Company 280
Powder Power Tools Co. 281
Powell Pressed Steel Co. 275
Powers Regulator Co. B-166, B-167
Pulverizing Machinery Co. B-192

Radio Corporation of America (Sound Products) B-56
Raybestos-Manhattan, Inc. 199
Raymond Corporation 230
Read-Standard Corporation 252
Ready-Power Company 126
Reeves Pulley Company 152
Reliance Electric & Engrg. Co. B-63
Remington Rand, Inc. 133
Repro-Templets, Inc. 239
Resolite Corporation B-190
Revolvator Co. 298, 306
Reynolds Metals Company B-181
Reznor Mfg. Co. B-136
Ridge Tool Co. 168, 172
RLM Standards Institute B-60
Rockford Screw Products Co. 262
Roebling's Sons Co., John A. 171
Rome Cable Corp. B-62
Roots-Connersville Blower Corp. 135
Round Chain Companies 218
Russell, Burdsall & Ward Bolt & Nut Co. 254, 262
Rust-Oleum Corporation 205
Ryerson & Son, Inc., Joseph T. 64

Schrader's Son, A. 269
Schramm, Inc. B-128, B-129, B-130, B-131
Scovill Mfg. Co. 262
Screw Research Assn. 262
Seamless Rubber Co. 276
Seattle Chain & Mfg. Co. 218
Servel, Inc. B-153
Service Recorder Co. 290
Shakeproof, Inc. 262
Shell Oil Company 58, 59
Shenango-Penn Mold Co. 214
Shepard-Niles Crane & Hoist Corp. 216
Signode Steel Strapping Co. 229
Simonds Abrasive Co. 312
Simonds Saw & Steel Co. 221
SKF Industries, Inc. 225
Skinner Co., M. B. 311
Sly Mfg. Co., W. W. B-152
Smith Corporation, A. O. 127
Smithcraft Lighting Div. B-67
Snap-on Tools Corporation 128
South Bend Lathe 286
Southern Chain & Mfg. Co. 218
Southington Hardware Mfg. Co. 262
Spang-Chalfant Div., National Supply Co. B-141
Spencer Turbine Company B-154
Sperti-Faraday, Inc. B-61
Square D Company 26, 27 Third Cover, Part I
Standard Conveyor Company 306
Standard Oil of Indiana 147
Standard Pressed Steel Co. 153, 191
Stanley Electric Tools Div., Stanley Works, Inc. 185
Stanley Works, Magic Door Div. B-127
Steelcraft Manufacturing Co. B-126
Sterling Electric Motors B-54
Sterling Bolt Company 262
Stewart Iron Works Co., Inc. B-174
Strom Steel Ball Co. 314
Stronghold Screw Products, Inc. 262
Sunnen Products Co. 267
Supreme Products, Inc. 250
Surface Combustion Corp. B-146
Sylvania Electric Products, Inc. B-65
Synthane Corporation 137

Taylor Company, Halsey W. B-144
TelAutograph Corporation B-68
Templeton-Kenly & Co. 308
Tennant Co., G. H. 220
Texas Company 66
Thew Shovel Company 139
Thomas Flexible Coupling Co. 140
Thompson & Son Co., Henry G. 150
Thompson Electric Co. B-66
Tide Water Associated Oil Co. 194
Tile-Tex Div., Flintkote Co. Second Cover, Part II
Timber Structures, Inc. B-190
Tinnerman Products, Inc. 241
Toledo Scale Company 130
Tomkins-Johnson Company 228
Towmotor Corporation 23
Trane Company B-189
Tremco Manufacturing Co. B-124
Tropical Paint & Oil Co. 243
Trumbull Dept., General Electric Co. B-69
Twin-Disc Clutch Co. 204
Typhoon Air Conditioning Co., Inc. B-184

Udylite Corporation 261
Union Oil Company 226
Union Pacific Railroad B-18
Unit Crane & Shovel Corp. 208
U. S. Hoffman Machinery Corp. 312
"Up-Right" Scaffolds B-193
U. S. Rubber Company 285
U. S. Steel Company 248, 268, B-13, B-169
Uvalde Rock Asphalt Co. B-188

Valley Electric Corporation 302
Veeder-Root, Inc. 11
"Visual" Planning Equipment Co., Inc. B-174
Vokes Co., H. L. B-139

Wagner Electric Company B-70
Wales-Beech Corp. 262
Water Cooling Corporation B-188
Watson-Stillman Co. 32
Wayne Crane Div., American Steel Dredge Co. 280
Weatherhead Company 175
Webb Company, Jervis B. 188
Western Felt Works (Arcadia Synthetic Products Div.) 22
Westinghouse Electric Corp. 48, 49, B-72, B-73, B-74, B-75, B-78, B-79, B-80, B-81, B-82
Westinghouse Electric Corp. (Elevator Dept.) B-173
Westinghouse Electric Corp. (Lamp Dept.) B-76, B-77
Westinghouse Electric Corp. (Sturtevant Div.) B-157
Whitney Blake Co. 158
Whiting Corporation 186
Wiegand Co., Edwin L. B-71
Williams Gauge Co. 288
Willson Products, Inc. 304
Wing Mfg. Co., L. J. B-180
Wiping Materials, Inc. 142
Woodhouse Chain Works 218
Worthington Pump & Machinery Corp. 279
Wright Hoist Div., American Chain & Cable Co. 255
Wrought Washer Mfg. Co. 282

Yale & Towne Mfg. Co. 61, 249

■

INDUSTRIAL Consultants 315

■

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Manager

EMPLOYMENT
Positions Vacant 316, 317
Positions Wanted 316
Employment Services 316
SPECIAL SERVICES 316
EDUCATIONAL
Books 316
BUSINESS OPPORTUNITIES
Offered 316
PROPERTY
For Sale 316
EQUIPMENT
(Used or Surplus New)
For Sale 316
WANTED
Equipment 316

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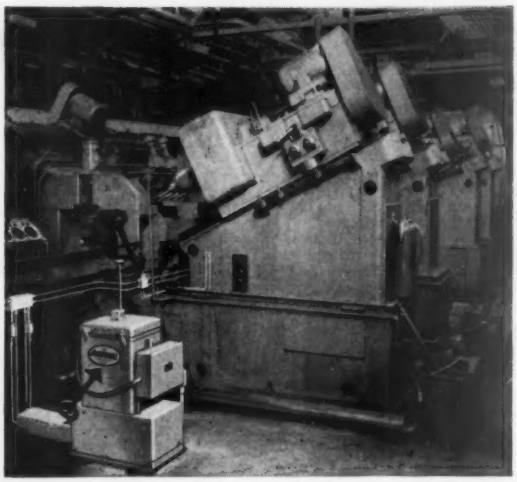

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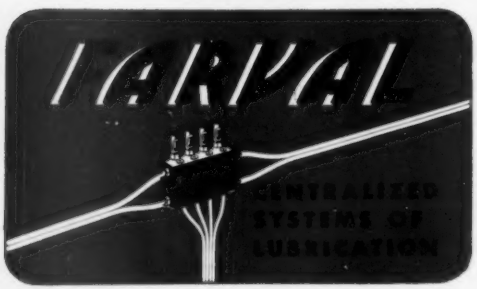

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